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Choosing To Compete

A Statewide Strategy For Job Creation And Economic Growth

A Collaboration of the
Executive Office of Economic Affairs
and the *University of Massachusetts*

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THE COMMONWEALTH OF MASSACHUSETTS

FRONT COVER PHOTOGRAPHS

Textile Looms, Mastex Industries, Holyoke. Photo Courtesy of the Massachusetts Industrial Finance Agency

Research Scientist, Collaborative Biomedical Products/Becton Dickinson Labware, Bedford

MassPep Pre-Engineering Program, Boston. Photo Courtesy of Raytheon, Inc.

Desalination System, Ionics, Incorporated, Watertown

Cranberry Harvesting, Wareham

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Today the Commonwealth faces a set of economic conditions which call for cold appraisal and swift action. The forces of intense global competition have created an environment where our continued economic leadership and prosperity can no longer be assumed. Massachusetts must awaken to the new economic realities and the urgent response which they require.

The Commonwealth is faced with a choice. We can either embrace the forces of change, and reassert our economic leadership as a world center for innovation, or we can resist, see our standard of living gradually erode, and fall permanently from prominence. The answer is clear: Massachusetts must choose to compete.

By reestablishing fiscal stability and a favorable climate for business investment, the work of the past two years has set the stage for more far-reaching change. We must seek to recreate the consensus which allowed us to respond so effectively to the fiscal crisis, and apply it to securing our long term economic competitiveness. Our goal must be to create an economy which offers high paying jobs and a high standard of living to all the citizens of Massachusetts.

This **Strategy** is a comprehensive long-term economic development blueprint for the Commonwealth. It examines, in detail, what the Commonwealth and each of its constituent regions need to improve and what can be done to facilitate that process.

The **Strategy** sets forth an agenda for state government's contribution to this effort. Specifically, it proposes the architecture for a new level of coordination and strategic direction within the government. It seeks to forge a new level of understanding and effective partnership between the public and private sector. The **Strategy** is premised on a commitment to maximize employment opportunities for citizens and areas in greatest need. Its fundamental goal is a high quality of life that encompasses both economic prosperity and environmental and cultural excellence.

Above all, this **Strategy** reflects the viewpoints and concerns of the citizens of Massachusetts. Well over a thousand people participated in the development of this document. We are grateful for their input, and hope that thousands more will join in a common effort to ensure that our economy remains competitive into the next century.

William F. Weld

Governor William F. Weld

Argeo Paul Cellucci

Lt. Governor Argeo Paul Cellucci

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THIS STRATEGY is intended to serve as a blueprint for how the Massachusetts state government can do its job well — in partnership with business, labor, and the research and academic community — by helping create a business environment that is nothing short of the best in the nation for business growth and new job creation.

CHAPTER OUTLINE

Chapter 1 introduces the *Strategy*, sets it in the context of recent state-level economic development initiatives, and describes the lengthy participatory process involved in preparing the document.

Chapter 2 sets forth the conceptual underpinnings for economic development policy and addresses the question of why state economic competitiveness is an important public policy issue.

Chapter 3 profiles Massachusetts, examines the nature and causes of the current economic downturn, and assesses the competitive strengths and weaknesses of the Massachusetts economy.

Chapter 4 articulates the fundamental goals of the state's economic development policies by stating a vision for the Massachusetts economy in five elements.

Chapter 5 identifies policies and actions designed to promote the achievement of those fundamental goals.

Chapter 6 outlines recommendations for strategic reorganization of state government to facilitate the implementation of policies promoting economic competitiveness.

Chapter 7 examines four special issue areas that pose complex problems requiring the coordination of a variety of policies and actions. These issue areas are urban economic development, rural economic development, defense restructuring, and small business creation and growth.

Chapter 8 profiles key industry sectors in Massachusetts' base economy.

Chapters 9 through 15 profile the economies of the state's seven regions: Berkshire County, Pioneer Valley, Central Massachusetts, Northeast Massachusetts, Greater Boston, Southeast Massachusetts, and the Cape and Islands.

SUMMARY OF FINDINGS, THEMES, AND RECOMMENDATIONS

The economic downturn that the Commonwealth is presently experiencing is more than a short-term, cyclical phenomenon. Businesses are shedding jobs not just because of weak demand associated with recession conditions, but because they are restructuring to achieve higher levels of productivity in the face of intense international competition. Exploding progress in the application of information technology to most sectors of the economy has meant that major productivity gains are possible for many businesses. This has sharpened competition and impelled many businesses to restructure their operations to achieve new efficiencies and remain competitive. In addition, entire market segments are being reshaped because of rapid product innovation or, in the case of defense-related businesses, major public policy decisions. In summary, the economy has not simply slowed down, it is in the process of restructuring itself. For many businesses, simply "waiting out" the downturn will not assure new job creation, or even survival.

Among the factors that can be influenced at the state level, competitiveness is the most important in determining how quickly the state recovers from the present downturn and how prosperous it will be in the long term. Clearly, some factors important to the performance of the state economy are beyond the reach of state policymakers — notably the health of the national and world economies. However, competitiveness is a "bottom-up" phenomenon. In the context of this *Strategy*, "competitiveness" refers both to the ability of each individual firm to succeed in the markets it serves and to the capacity of the business environment offered by the state to foster

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and support the growth of competitive firms. This *Strategy* is premised on the conviction that Massachusetts firms should embrace rather than resist the productivity revolution, and seek to be at the leading edge of their industries. At the same time, the opening of new markets, the development of new products, and the creation of new companies are essential to assure job growth as the economy becomes more productive.

The Massachusetts economy has fundamental competitive strengths that can provide the foundation for renewed growth. However, significant weaknesses in the economy, combined with intense national and global competition for new growth businesses, mean that net job creation is not assured. The competitive strengths of the Massachusetts economy include:

- ***World class higher educational and research capabilities.***
- ***A highly skilled workforce*** that achieves labor productivity rates well above national norms.
- ***Leading positions in emerging technologies*** such as high performance computing, environmental sciences, biotechnology, and advanced materials.
- ***Successful and promising core industry clusters*** like health care, information technology, financial services, knowledge creation, and modernizing traditional industries.
- ***A broad-based economy*** consisting of diverse business sectors.
- ***Locational advantages*** such as proximity to major U.S. markets and population centers, and faster access to Europe than any other state.
- ***A high quality of life*** that includes exceptional cultural, recreational, and educational offerings.

However, the competitive challenges faced by the state include:

- ***Upheaval in two major Massachusetts industries — minicomputers and defense*** — that has left many of the state's skilled workers and engineers unemployed and at risk of leaving the workforce permanently.
- ***A reputation for an unresponsive government*** that is unconcerned about creating a business environment conducive to long-term growth.
- ***A poor image with business*** as a difficult place to grow and operate a company because of an unstable tax environment, poor labor-management relations, excessive and cumbersome regulation, and inconsistent government policies.
- ***A high cost of doing business,*** including important costs determined or regulated by state government. Massachusetts ranks among the top ten states nationwide in the costs of workers' compensation, unemployment insurance, health insurance, and energy.
- ***A high cost of living*** — although relative prices are moderating somewhat due to the recession.
- ***Pockets of severe economic disadvantage*** in urban and rural communities characterized by chronic high unemployment and limited prospects for job growth without public action.

A *Strategy* to guide the state government in helping to improve the Commonwealth's competitive position must be built around a clear vision of what the economy should become. Such a vision for the Massachusetts economy is described in Chapter 4 of the *Strategy* in five elements:

- ***A high overall standard of living.*** A high living standard is the first goal of efforts to improve state competitiveness. Achieving this goal requires high labor productivity levels. In general, a business cannot pay high average wages unless it can produce high value output, in dollar terms, of products and services for a given unit of labor input. Productivity, in turn, depends on a variety of factors, some intrinsic to each firm and some related to the business environment. Examples of the latter include the availability of credit and capital for investment and modernization, the availability of educated and skilled workers, and the presence of reasonable regulatory and tax environments.
- ***Job growth.*** Productivity improvement is a two-edged sword, since it can mean fewer workers are needed to produce a given level of output. High wages are not the complete answer if many remain out of work. Therefore, the business environment must encourage not only productivity gains but also access to new markets, particularly through exporting, the development of new products, and the creation of new companies. Diversification of markets, products, and companies is the real key to job growth.
- ***Vibrant and diverse regional economies.*** While some observers, particularly those from out-of-state, identify the Massachusetts economy with the advanced, research-based economy of Boston, Cambridge, and Route 128, the real economy is more complex. Traditional manufacturing — including metalworking, plastics, textiles, and paper — tourism, marine industries, forest products and agriculture, financial services, and health services are all critical to the economic health of one or more regions of the state. Economic policies must recognize and promote this diversity.
- ***Broad economic opportunity.*** Even in times of growth, certain areas of the Commonwealth have failed to prosper. The rising tide has not floated all boats. These areas include depressed inner city communities, idled mill towns, and rural pockets of poverty. The best social program is a job. The targeting of resources, through incentives and preferences for job creation, is necessary to assure that the advantages of job growth can reach these areas.
- ***A good quality of life.*** The quality of life enjoyed by citizens of the Commonwealth depends on economic and non-economic factors. For most people, a

good job and reasonable wages are important to a decent quality of life. Also important are non-economic elements like public safety, educational opportunity, cultural and recreational resources, and environmental quality. Non-economic elements of the quality of life, in addition to being intrinsically valuable, are relevant to economic competitiveness because they make the state more attractive to skilled workers and to executives making business location decisions. Conversely, economic competitiveness creates the prosperity needed to enhance the non-economic elements. Economic development policies must reflect these interdependencies.

Competitiveness is primarily a private sector phenomenon, but the government does have a clear role to play as one of four key partners. The four "competitiveness partners" are:

- *Private businesses.* The primary responsibility for business competitiveness in Massachusetts rests with Massachusetts businesses. Business managers and owners must make the fundamental decisions regarding investment, location, product development, marketing, and hiring which create successful enterprises — and grow the economy.
- *Labor.* Few companies can implement innovative business methods, reach new levels of competitiveness, or achieve significant growth without the enthusiastic support of their employees. At the same time, workers are recognizing the importance of company competitiveness to the quality and security of their own employment.
- *The academic and research communities.* It is clear that institutions of higher learning and research are vital to advanced, innovation-based economies like that of Massachusetts. New legal models are being developed to allow academic and research institutions to cooperate successfully with for-profit businesses while continuing to pursue their non-commercial missions.
- *Government.* The role of government in increasing state economic competitiveness can easily be understated or overstated. The government cannot productively dictate private sector economic decisions to create a more competitive economy or finance single-handedly an economic recovery. However, the state government has a substantial influence on the climate in which private decisions are made — to invest, to modernize, to expand, to train workers, to create new companies, to commercialize new products, and to export. In turn, these decisions determine the economy's ability to create and retain jobs.

The primary role of government in promoting competitiveness relates to its effect on the business environment within which private economic decisions are made. Characteristics of a favorable business environment are described below. Each of the characteristics identified can be influenced by state government. Some, like the state tax and regulatory policy, are determined by state government. These characteristics provide the basis for describing, in Chapter 5, a set of state government actions which can promote a more competitive economy without substituting government officials for private decision-makers.

Characteristics of a favorable business environment and corresponding categories for state action to improve the competitiveness of the state economy are discussed in detail in Chapter 5. They are as follows:

- *The tax environment is reasonable and stable.* The fundamental requirement for a stable tax environment is fiscal stability at the state level. Out-of-control budgets send employers the message that new taxes may be necessary to bail out the government. See Action Category 1.
- *Other government-affected business costs are low.* Significant business costs result from government-managed programs, such as the unemployment insurance and workers' compensation systems. Other major business costs are imposed by private companies whose prices are regulated, including health and other insurance providers and utilities. Reform

Maintaining a high quality of life is the ultimate goal of this *Strategy*. A strong economy, strong environmental protection, and a strong cultural life can reinforce each other.

Photo courtesy of the Massachusetts Office of Travel and Tourism.

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of unemployment insurance, workers' compensation, and the health insurance system, and a comprehensive energy plan to hold down energy costs, are among the items outlined in Action Category 2.

- ***Regulatory delays will not slow time to market or prevent the construction of new facilities.*** No one contests the need for a strong regulatory system to protect the public health and welfare and preserve the natural environment. However, a state that can regulate effectively without imposing unnecessary costs or delays on business will enjoy a substantial competitive advantage over others in growing and attracting companies.

  In this *Strategy*, "Regulatory Reform" refers to the process of examining existing regulations and, where appropriate, retiring or modifying those that no longer serve a discernible public interest or which are duplicative of other requirements. See Action Category 3. "Permit Streamlining" refers to procedural reforms designed not to change substantive standards but to make the process of obtaining permits and approvals faster, easier to work with, and more predictable. See Action Category 3 and Chapter 6. In addition, certain "win-win" strategies for pollution prevention can encourage technologies that promote environmental quality and economic competitiveness at the same time. Energy conservation is the most familiar example. See Action Category 4.

- ***Transportation and communications are fast and reliable.*** Building infrastructure for an efficient transportation system is a traditional role for government, although not all transportation infrastructure is publicly financed. State capital planners must seek to identify those infrastructure investments with the greatest prospects for increasing permanent employment and improving competitiveness. Infrastructure expenditures motivated primarily by a desire to create short-term construction jobs represent a highly inefficient use of public resources to assist the economy. Action Category 5 describes the state's existing infrastructure investment programs and the proposal for a new $500 million economic development capital program.

An education system which imbues students with strong skills is the foundation for economic growth.

Photo courtesy of Raytheon.

- ***The workforce is educated.*** One of the most important factors in encouraging companies to grow in a high-wage environment is the quality of the workforce. The application of computerization to everything from machine tools to restaurant order-taking means that basic verbal and math skills are required for most jobs. Truly unskilled jobs are disappearing from the economy. Governor Weld has identified education as one of the top three priorities of his Administration. While Massachusetts benefits from world-class private colleges and universities, emphasis must be placed on improving primary and secondary education and the state's public university system. Action Category 6 describes reform proposals to be coupled with necessary shifting of resources to education — one of the state's most important "investment accounts."

- ***Workers are skilled or training is available to provide needed skills.*** In an economy undergoing restructuring, with businesses adopting new business methods to remain competitive and turning to new market areas, there is a desperate need for industry-specific job training. Training is needed not only for workers who are already out of work or indigent, but also for employed workers in jobs that must upgrade skills in order to adjust to technology advancements. The MassJobs Council, under the leadership of Lieutenant Governor Cellucci, has taken on the task of organizing the state's fragmented job training system and directing its efforts toward addressing the real needs of the economy. See Action Category 7.

- ***Knowledge of efficient management and production practices is readily available.*** An Industrial Extension Service — based on the long-successful Agricultural Extension model — can make knowledge

of the best management, quality control, and production techniques available to small and medium-sized manufacturers who do not have the resources to apply that knowledge to their own needs or to keep up with the latest developments. Funding for an Industrial Extension Service will likely be part of the defense industry conversion programs now being developed by the federal government. See Action Category 8.

- ***The university and research sectors provide a stream of ideas for innovative products and services.*** Enterprise and the application of new ideas to commerce have been the traditional keys to Massachusetts' economic competitiveness. The high-tech boom of the 1970s and 1980s demonstrated the importance of the organized research capacities of major universities and research institutions to the development of ideas capable of being commercialized into new products. The Massachusetts Institute of Technology's Licensing Office is an example of a highly successful private technology transfer operation. The University of Massachusetts, the state's public university system, is now developing its own highly innovative institutional structures to encourage the application of ideas developed in university research to the marketplace. The Commonwealth also has a role to play, in cooperation with the federal government, in ensuring that federally sponsored research in the state continues to support business opportunity. See Action Category 9.

- ***Investment capital and needed credit are available.*** Increasing productivity and hiring new employees require investment. An equity and credit-starved economy is one in which it is hard to nurture business creation and growth. Unfortunately, the "credit crunch" is real, driven largely by the collapse of the real estate market and increasingly stringent regulation of the banking industry. Equity availability is affected as investors move to "safer" investments to fill the vacuum created by the departure of lenders from their traditional markets. Yet the economy needs capital most when, as now, businesses are undergoing restructuring to remain competitive. Under current conditions, there is a strategic role to be played by the government in encouraging private lenders to reenter the financing markets. Tax incentives, such as the investment tax credit and capital gains tax relief, can lower the overall cost of capital to promote the modernization of the economy and new business formation. The Governor's Jobs Package, announced in the fall of 1992, consisted primarily of measures designed to combat the "credit crunch." See Action Category 10.

- ***Barriers to exporting are removed.*** Creating new jobs requires reaching new markets. The most exciting new markets are in those economies, principally in Latin America and Asia, that are experiencing double-digit growth rates, and not necessarily in the affluent but slowly growing U.S. economy. In addition, Massachusetts' location offers advantages for exports of both goods and services to European countries, including shorter flying and shipping times and a less disruptive time zone difference compared to midwestern and west coast locations. Identifying and gaining access to new export markets is primarily the responsibility of each business. However, the Commonwealth can play a significant role in encouraging exports by raising awareness of the opportunities through well-publicized trade missions, by providing basic training in exporting through seminars, and by encouraging private lenders to finance manufacturing for export through an export guarantee fund. See Action Category 11.

- ***The state government is accessible to businesses at the regional level, and economic development efforts are carried out through cooperation between local and state government.*** As Chapters 9 through 15 of this *Strategy* make clear in some detail, the Massachusetts economy is made up of distinct regional economies, each with its own mix of industries, labor market characteristics, and competitive strengths and weaknesses. Moreover, economic growth begins at the local level. The structure of the state's economic development activities must reflect these realities. Regional offices are needed that can provide access on a "one-stop shopping" basis to Commonwealth agencies and services relevant to business growth. Such offices would also enhance the ability of state officials to work successfully with local officials in promoting business expansion and job creation. The strategic planning role of regional economic development organizations should be enhanced to improve cooperation among all levels of government and minimize potential conflicts between regulatory and economic development agendas. See Action Category 12.

Implementation is the key to any successful strategy. Chapters 4 and 5 include performance measures that can be used to assess progress toward achieving the goals and recommendations set forth in the *Strategy*. In addition, key changes to the structure and procedures of state government would vastly increase its ability to pursue an agenda for economic competitiveness. Both *strategic coordination* and *project coordination* are necessary.

***Strategic coordination* is the capacity of government to pursue a consistent agenda for economic competitiveness across its diverse agencies. Chapter 6 discusses how better coordination could be achieved in state government.** A strategic planning function should be created within either the Governor's Office or the Executive Office of Administration and Finance to assure that the state's operating and capital budgets and new regulations are consistent with the goals and recommendations of the *Strategy*. A separate economic policy research activity at the Executive Office of Economic Affairs can work with other agencies and the University of Massachusetts to update the *Strategy* periodically, to assess and report on progress

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toward achieving the goals of the *Strategy* as indicated by performance measures, and to work with officials outside state government to develop local and regional economic development goals consistent with the *Strategy*.

Project coordination **addresses the fact that the main procedural hindrance to the Commonwealth's ability to encourage new project development is fragmentation, i.e. the scattering of related functions among multiple independent staffs.** The state's reputation as a place that is friendly or hostile to business growth and expansion rests substantially on the treatment each project receives in its dealings with state government. A company with a project that involves contact with state government often must deal with multiple staffs and with multiple — and sometimes conflicting — requirements and expectations. Government agencies with overlapping functions can represent a formidable challenge to companies trying to discover who is responsible for activities related to their project and how to meet the demands of many agencies at once. The company must "connect the dots" itself, in the absence of government's ability to coordinate its own operations. There are four key functional areas in which fragmentation poses a particular problem both for government managers and private firms. These four areas are:

- The delivery of economic development assistance, particularly through the Commonwealth's quasi-public organizations.
- Capital spending for public infrastructure in support of private economic development projects.
- The delivery of training assistance.
- Environmental permitting and project approval.

Remedying fragmentation in each of these areas involves the active coordination of functions among separate staffs or the consolidation of functions in a single staff. Where direct contact between staffs and businesses is involved, "one-stop shopping" models of service delivery should be implemented and a customer-driven approach adopted. Businesses should be offered a single point of entry into the relevant system, and a single point of ongoing contact. In short, they should know where to turn at each step in seeking help or seeking permission from the government. Decision processes should be designed to provide prompt and coordinated decision-making — not multiple, uncoordinated actions from several independent staffs or boards.

Certain "cross-cutting" issues demonstrate how particular economic challenges require a coordinated response combining multiple strategies. Chapter 7 discusses four critical issues: inner-city economic development, rural economic development, defense industry restructuring, and the special needs of small business.

While some recommendations offered in this *Strategy* will have broad-based effects across industry and regional lines in improving competitiveness, many must be implemented on an industry-specific basis to be effective. Worker training is a clear example. To obtain the maximum benefit from each training dollar spent, workers must be given specific skills relevant to the needs of particular industries. One of the primary objectives of the MassJobs Council is ensuring that training programs can be delivered on an industry-specific basis. Similarly, programs designed to stimulate the availability of capital and credit will have differential impacts by industry. Assistance in obtaining working capital loans is particularly needed by small businesses, including those affected by cuts in defense spending. Partial guarantees for new facility construction are needed by companies moving from research to advanced manufacturing, including companies in biotechnology and advanced materials. Micro-lending is needed for small businesses in distressed urban and rural areas. Chapter 8 provides profiles of industries and clusters of industries important to the state and its regions.

Regional differences are critically important to the implementation of the *Strategy's* recommendations as well. Actions to promote the state's traditional manufacturing enterprises are most important to those regions where traditional manufacturing provides a high percentage of the job base, such as Southeast Massachusetts. The promotion of tourism has the greatest impact relative to other sources of employment on the Cape and Islands and in the Berkshires. Technology transfer is now concentrated in Greater Boston and Central Massachusetts, and is limited in other parts of the state. The University of Massachusetts is developing technology transfer operations at its Amherst, Lowell and Dartmouth campuses that could significantly boost the creation and growth of new, advanced technology businesses in these areas. The recommendation for the establishment of regional centers for the delivery of economic development assistance reflects a recognition of the importance of regional diversity in implementing the *Strategy*. Chapters 9 through 15 document the diversity of the Massachusetts economy by region. The regional profiles are intended as a first step toward the Commonwealth's participation in the development and implementation of regional economic strategies in concert with local and regional interests.

Chapter 1 Introduction

Adversity can create opportunity.

Adversity is visiting Massachusetts in the form of the worst economic downturn since the Great Depression. In 1989, Massachusetts was one of the first states in the country to enter recession. In less than 36 months it lost over 14 percent of its total jobs — the highest rate of job loss per capita in the nation. While the "free fall" in job losses now appears to be ending, uncertainty hangs over the economy's ability to produce significant new job growth.

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Adversity presents the Commonwealth with the opportunity to achieve broad consensus on a set of policies to increase economic competitiveness and broaden the base of economic opportunity for all its citizens. Adversity has created the political impetus to consider and address publicly what the Massachusetts economy needs once again to grow and create jobs.

This report is entitled "Choosing to Compete" to emphasize that the citizens and leaders of Massachusetts face a choice. That choice is whether to seize the opportunity to build a better economic future for themselves and their children, or to let that opportunity pass by.

The overriding conclusion of this document is that the citizens of the Commonwealth, acting through their state and local governments, can control their economic future. If we choose to compete we can increase economic prosperity and the availability and diversity of good jobs.

Three basic themes are expressed throughout the report:

First, state government inevitably has a substantial impact on the economic marketplace and the ability of businesses to compete. The question is whether it will have a positive or negative impact. Government actions are likelier to encourage rather than impede growth when policy is informed by an understanding of what is needed to create a more competitive economy.

Second, economic growth occurs firm-by-firm, municipality-by-municipality, industry-by-industry, and region-by-region. Massachusetts contains a number of distinct economies — from the tourism and retirement-oriented economy of the Cape and Islands, to the traditional manufacturing industries of Central Massachusetts, to the research-based firms of Cambridge and the Boston suburbs. A successful policy for economic growth must reflect a detailed understanding of what is actually happening in each region and industry, and an acknowledgement that there can be no single answer to the question of how to foster job creation. Therefore, nearly half of this report is devoted to summaries of employment patterns and industry mix, both statewide and in each of the Commonwealth's seven regions. A number of the recommendations offered are designed to connect state policy and actions more directly to localities and regions.

Third, the basic formula for growth is long-term investment in its many forms — investment in plant modernization, public infrastructure, research and development, education and training, and the introduction of new management approaches and procedures in the public and private sectors. There is no short-cut to competitiveness that does not involve near-term costs. In order to "grow the pie," society as a whole must shift its priorities by reallocating resources from present consumption to investment for the long term. Government can play a substantial role in bringing about this shift by redirecting its own priorities and by fostering an economic environment conducive to private-sector savings and investment.

Introduction

THE PURPOSE AND GOALS OF THIS *STRATEGY*

This economic development *Strategy* is a description of the ways in which the government can have a positive impact on a private, free enterprise economy. It is not a plan for the state economy —it is a plan for the state government's role in the economy.

This *Strategy* is intended to serve as a blueprint for how the Massachusetts state government can do its job well—in partnership with business, labor, and the research and academic communities—by helping create an environment that is the best in the nation for business innovation and new job creation.

The document does not suggest that the government can or should direct private economic decisions nor seek to finance single-handedly an economic recovery. It does contend that the state government can have a substantial influence on the climate in which private decisions are made to invest, to modernize, to expand, to train workers, to create new companies, to commercialize new products, and to export. In turn, these decisions determine the economy's ability to create and retain jobs.

This *Strategy* describes an agenda for action in the following steps:

- *It describes a vision for the Massachusetts economy* in the year 2000 and beyond. The basic elements are non-controversial: a high living standard, job growth, strong regional economies, broad economic opportunity, and a good quality of life.
- *It profiles where the economy is now* by analyzing the competitive strengths and weaknesses of the economy statewide and on a region-by-region basis.
- *It identifies the basic economic development priorities and strategies* by which the agencies of state government can improve the business climate and accelerate progress toward renewed growth, and identifies objective performance standards to measure progress.
- *It recommends an implementation framework* to improve the capacity of the state government to achieve its economic development objectives efficiently and cost-effectively.

HOW THIS *STRATEGY* RELATES TO ONGOING ECONOMIC DEVELOPMENT POLICIES AND ACTIONS OF THE WELD-CELLUCCI ADMINISTRATION

Upon its inauguration in January 1991, the Weld-Cellucci Administration set a new economic agenda for Massachusetts state government. The fundamental objective was to transform state government from a drag on the economy into a vehicle for economic recovery. The Commonwealth was in difficult circumstances, with budget shortages, rapidly rising taxes and costs, a plummeting bond rating, and a harsh regulatory climate that together discouraged businesses from investing here. Reversing this condition has been the primary task of the Administration.

The overriding conclusion of this document is that the citizens of the Commonwealth, acting through their state and local governments, can control their economic future. They can choose to compete.

Since that time, much has been achieved. It is not the purpose of this *Strategy* to dwell on past accomplishments, but it is important to see the *Strategy* as the articulation of a set of policies whose implementation is already underway.

- ***Fiscal Stability and Lower Taxes.*** The Commonwealth has eliminated its deficit and balanced three consecutive budgets while lowering taxes four times. In the past two years, Massachusetts has repealed a sales tax on services, lowered the personal income tax, enacted the nation's most agressive R&D tax credit, and initiated a phase-out of its estate tax. Wall Street has acknowledged the state's sound fiscal management after years of budget disarray by granting Massachusetts an unprecedented triple upgrade in its bond rating.
- ***Regulatory Reform.*** The Weld-Cellucci Administration launched Phase I of a Regulatory Reform initiative in 1991, targeting 131 regulations that imposed substantial costs on businesses without a justifying public purpose. Nearly half of those regulations requiring only administrative action for correction have been addressed, and some of the most onerous regulations in the state have undergone considerable reform.
- ***Government Regulated Costs.*** The Commonwealth enacted legislation for comprehensive reform of the workers' compensation system, improvement in the unemployment insurance system, and hospital finance reform that together have saved businesses hundreds of millions of dollars.
- ***Innovation.*** In 1991, the Massachusetts Legislature instituted the nation's most generous research and development tax credit to support productivity improvements and the discovery and application of new technology. The Weld-Cellucci Administration also created the Massachusetts Quality Award to spotlight exceptional examples of companies employing state-of-the-art equipment, production processes, marketing strategies, and workforce training programs.
- ***Training.*** Massachusetts was chosen by the National Alliance of Business in 1992 as "state of the year" for being on the cutting edge of job training policy. This award recognized the Administration's creation of the MassJobs Council to transform the state's $365 million assortment of job training programs into a market-driven workforce development system. This system will meet the needs of businesses and workers rather than government agencies or service providers.

- ***Export Promotion.*** The Administration has emphasized the development of new markets for Massachusetts products. Trade missions and new trade offices have strengthened Massachusetts' export ties to existing trade partners and have helped open new markets in East Asia, Eastern Europe, and the Middle East. Trade missions alone have brought Massachusetts businesses over $100 million in new overseas orders.
- ***Public/Private Partnerships.*** The Governor's Council on Economic Growth and Technology has brought together leaders from the business, academic, and scientific communities to provide direct input to the Governor on a wide range of economic policy issues. The efforts of the Governor's Council and other groups, such as the Massachusetts Alliance for Economic Development, have resulted in initiatives such as an Ambassador's Program to bring investment into Massachusetts, and have been important sources of guidance for the development of this *Strategy*.

Much has been done, but much more remains to be done. What this document offers, for the first time, is a comprehensive review of the Massachusetts economy and a unified policy blueprint for state government's role in improving its competitiveness.

PREPARATION OF THE *STRATEGY*

In early 1992, Governor William Weld called for the preparation of this *Strategy* as part of his overall commitment to improve the state's economic climate. Development of the *Strategy* was taken on as a collaborative effort of the Executive Office of Economic Affairs, under Secretary Stephen P. Tocco, and the University of Massachusetts. The University's collaboration was initiated by interim President E. K. Fretwell and completed under the leadership of the University's new President, Michael K. Hooker.

From the outset it was determined that the *Strategy* must not be simply another consultant report or the work of a "blue ribbon" panel. Rather, it would reflect the experience and ideas of people throughout the state concerned with economic growth and job creation.

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Accordingly, seven "focus sessions" on specific economic development topics ranging from infrastructure policy to urban job creation strategies were held during the summer of 1992. Representatives from every region of the state, including business leaders, elected officials, community and non-profit representatives, and experts in economic development, shared their views on the following issues:

- *Expanding the Base of Our Economy to Provide Good Jobs,* held at the University of Massachusetts at Lowell.
- *Investing in Economic Infrastructure,* held at the University of Massachusetts at Worcester.
- *Improving Education and Training for Economic Development,* held at the University of Massachusetts at Boston.
- *Ensuring Access to Credit, Capital, and Technical Assistance,* held at the University of Massachusetts at Dartmouth.
- *Ensuring Quality Growth: The Economy and the Regulatory Environment,* held at the University of Massachusetts at Amherst.
- *Building Urban Employment Opportunities,* held at the University of Massachusetts at Boston.
- *Rural and Small City Development,* held at Mt. Wachusett Community College in Gardner.

Following the meetings, the participants helped prepare preliminary findings and recommendations on these topics. These formed the basis for major economic development conferences held during the fall of 1992 in the state's seven regions. The conferences were interactive working sessions in which participants discussed issues and recommendations related to the state's economic growth policies with Cabinet and sub-cabinet level state officials. The Governor or Lieutenant Governor attended each conference. The conferences and focus sessions cited below provided a means for the drafters of the *Strategy* to draw on the insights and ideas of over 1,200 regional public and private sector leaders.

- Berkshire Region, held at Berkshire Community College, Pittsfield.
- Pioneer Valley Region, held at the University of Massachusetts at Amherst.
- Central Region, held at the University of Massachusetts at Worcester.
- Northeast Region, held at the University of Massachusetts at Lowell.
- Greater Boston Region, held at the University of Massachusetts at Boston.
- Southeast Region, held at the University of Massachusetts at Dartmouth.
- Cape and Islands Region, held at Cape Cod Community College, Barnstable.

This *Strategy* also builds on a substantial foundation of prior studies. Among the most important are two studies of competitiveness in Massachusetts prepared by the Monitor Company and Professor Michael Porter of the Harvard Business School: *The Competitive Advantage of Massachusetts,* published in 1991, and *Toward a Shared Economic Vision for Massachusetts,* published in 1992 in collaboration with the civic group, Challenge to Leadership. With Professor Porter's permission, the

Introduction

drafters of this *Strategy* have drawn substantially on these works.

Several reports on the competitive position of specific Massachusetts industries also provide a basis for the *Strategy.* Of particular importance were studies conducted by subcommittees of the Governor's Council on Economic Growth and Technology, and studies commissioned by the Massachusetts Center for Technology Growth.

In addition, the *Strategy* draws extensively upon regional economic development studies and strategies. These regional documents include, among many others:

- The Overall Economic Development Plans (OEDPs) developed by a number of regional planning agencies around the state for the federal Economic Development Administration.
- The Workforce Development Policy Blueprints written for the MassJobs Council by the 16 Regional Employment Boards, which determine the training needs of current and emerging industries in every part of the state.
- Regional land use strategies such as the *Regional Policy Plan* of the Cape Cod Commission, and *MetroPlan 2000,* a development plan for the Greater Boston Region created by the Metropolitan Area Planning Commission.
- Special studies on topics of particular importance to individual regions, such as *The High Skills Path for Southeastern Massachusetts,* by the Southeastern Massachusetts Partnership.

A full bibliography appears in the appendices.

A substantial amount of new research has been undertaken for this *Strategy* by the Economic Policy Research Unit of the Executive Office of Economic Affairs in cooperation with the University of Massachusetts, the Department of Employment and Training, and the Division of Capital Planning and Operations.

Findings and policy recommendations have been reviewed with policymakers across many secretariats and agencies of state government, including the Executive Offices of Consumer Affairs, Communities and Development, Education, Environmental Affairs, and Transportation and Construction. Agencies consulted include the Banking Commission, the Department of Environmental Protection, the Department of Employment and Training, the Massachusetts Highway Department, the Massachusetts Bay Transit Authority, the Turnpike and Port Authorities, and the Division of Capital Planning and Operations.

Chapter 2: Competitiveness and State Government

This chapter addresses three questions that provide the conceptual underpinnings for the *Strategy:*

- What is economic competitiveness?
- Why does competitiveness matter?
- What is the proper role of state government in improving the state's competitive position?

What Economic Competitiveness Means

For an individual firm, "competitiveness" hinges on the ability to offer products or services which are of higher quality or lower cost than others on the marketplace. A firm's ability to remain competitive depends on the productivity of its workforce, its capital investments, and the efficiency with which it employs material inputs.

For a geographic area such as a state or nation, "competitiveness" is sometimes used to mean high average productivity. In this sense, to say that Massachusetts has a "competitive economy" means that its economy, in general, is made up of highly productive firms.

In this *Strategy,* the phrase "state competitiveness" is used to refer to the state's suitability or attractiveness as a location for existing or new firms, and particularly for firms which offer new high wage employment appropriate to the education and skill levels of the available workforce. This parallels the use of the concept in connection with individual firms. The state location itself is the product being offered, and the term "competitiveness" addresses the value attached to this location, particularly by expanding firms, relative to the cost structure of doing business here. Increasing the "competitiveness" of Massachusetts, in this sense, means increasing the suitability and attractiveness of the state as the location for expanding, high-wage industries.

The leading study of competitive advantage at the national level is Harvard Business School Professor Michael Porter's *The Competitive Advantage of Nations.* Professor Porter argues that a nation (or state) cannot be competitive for all types of industries, and that therefore its competitiveness is an industry-specific phenomenon. In Professor Porter's view, competitive advantage for a particular industry flows from the presence of certain essential factors: the local availability of specialized labor, technology, and infrastructure; a sophisticated and demanding local customer base; a number of vigorous local competitors; and a network of supporting industries such as specialized suppliers and service providers.

However, there is one factor that stands out in Professor Porter's work as the key ingredient for competitive advantage: the willingness and ability of firms to *innovate.* Indeed, many of the determinants of competitive advantage identified make greatest sense when recognized as either facilitating or goading constant innovation at the firm level.

Many of the determinants of competitive advantage identified by Professor Porter depend on the local presence of a "cluster" of companies in related business sectors. He notes that successful, related businesses tend to cluster geographically—as seen with pharmaceuticals in New Jersey, films in Hollywood, high-fashion shoes in northern Italy, and cut flowers in Holland.

One of Massachusetts' greatest eras of prosperity was founded on its dominance of the nation's textile and shoe trade. Today, the state's prosperity must be based on the application of innovation and technology to a variety of industries, from textiles to telecommunications.

Photo of House of Bianchi courtesy of the Massachusetts Industrial Finance Agency.

Competitiveness and State Government

The health care sector is an example of one of Massachusetts' strong industry "clusters." It consists of related businesses and institutions which range from hospitals and medical schools to medical instrument manufacturers and biotechnology companies. These businesses and institutions compete with one another, train and expand the local pool of skilled workers, attract specialized suppliers, and produce an extensive web of interrelationships which facilitates the rapid exchange and development of ideas. The depth and diversity of this cluster help make Massachusetts an attractive location for new and growing businesses in the health care area. See Chapter 8 for a fuller description of the health care cluster.

While *The Competitive Advantage of Nations* emphasizes the industry-specific nature of the factors underlying competitiveness, Professor Porter's recent evaluation of the Massachusetts economy, *Toward a Shared Economic Vision for Massachusetts,* also acknowledges the importance to state competitiveness of certain generic factors with broad impacts across industry lines, such as a stable tax environment and an attractive climate for investment. This *Strategy* takes a similar approach, recommending that certain actions must be targeted to specific industry segments in order to be effective (e.g. job training), while other actions are likely to have a positive impact for most companies, regardless of their type.

WHY COMPETITIVENESS MATTERS

It is important to address the question of why competitiveness is a *public* policy issue. There has been much public discussion on the need to promote job creation in the wake of the post-1988 recession. However, the consensus necessary for decisive action has remained uncertain. To too great an extent, politics has remained a battle for the distribution of present resources, not an inquiry into how those resources might be better invested in our future.

This section offers two perspectives. One is historical, reminding us that the Commonwealth has seen both good times and bad. There have been times when Massachusetts businesses have been at the leading edge of competitiveness, and times when they have not. A look back suggests that the Bay State has no discernible "divine right" to competitiveness or prosperity.

The second perspective relates to the nature of present day competition itself. Like businesses across the nation, Massachusetts firms are being exposed to international competition that far exceeds anything seen since the United States' ascension as the premier commercial and industrial power after the end of World War II. Moreover, states and nations themselves are competing vigorously as locations for growing, high wage businesses. These changes mark a fundamental reorganization of business with far-reaching implications for workers, firms and government.

Massachusetts and its residents have thrived when the state's businesses have positioned themselves at the leading edge of new technologies and have seized opportunities to export to other states and nations.

A Brief Historical Perspective

Massachusetts and its residents have thrived when the state's businesses have positioned themselves at the leading edge of new technologies and have seized opportunities to export to other states and nations. But the Massachusetts economy has also endured lengthy periods of stagnation brought on by the loss of competitiveness in key businesses, resulting in protracted job losses, static or declining living standards, and persistently high unemployment.

It is common to think of the ebb and flow of prosperity in the state as being linked to the business cycle of recession and expansion that has taken place in the United States and Massachusetts. Cambridge's National Bureau of Economic Research has tracked the business cycle since 1854 and recorded 30 expansionary periods and 30 recessions between that date and the beginning of the most recent recession. The average cycle of expansion and recession during that period has been four years and three months.

However, an analysis of Massachusetts' economic history also reveals that there is a longer-term process behind the business cycle. That process is characterized by the emergence and growth of a group of internationally competitive businesses in the state capable of generating periods of prolonged growth in which business cycle expansions are maximized and recessions minimized. There have also been subsequent periods of competitive decline for these businesses during which the reverse occurs.

A Maritime Economy

The first such burst of prosperity in Massachusetts occurred in the decades immediately following the Declaration of Independence, and was founded on success in shipping, maritime trade, and whaling. Massachusetts maritime industries were nationally dominant and Boston shipping totaled over one third of the total merchant marine tonnage in the United States. Massachusetts remains active in shipping and maritime activities to this day, but its era of maritime dominance in the United States began slipping away in the early 19th century as the completion of the Erie Canal provided access to the Great Lakes and the West—and an insurmountable competitive advantage—to the Port of New York.

Mass Commodity Manufacturing

The second great burst of economic growth in the Bay State had its roots in the development of factory towns in the early nineteenth century, and came into its own in the post Civil War era. Massachusetts businesses mastered the art of mass commodity manufacturing and reached international markets through new rail and steamship networks. Manufacturing products ranging from tooth-

picks to automobiles poured out of Massachusetts' mills, and Boston emerged as a national financial center. This era of competitiveness and growth profoundly altered the Massachusetts landscape, with the construction of giant factories and housing tracts. Well before the onset of the Great Depression, however, Massachusetts manufacturing firms were losing their competitive edge. The 1920s alone saw the loss of over 150,000 manufacturing jobs in Massachusetts, as plant operations were closed or relocated to southern states, seeking cheaper labor, raw materials, power and transportation. In the decades that followed, competitive businesses did not emerge in sufficient numbers to replace the jobs lost in the declining manufacturing sector. The state entered a period of decline or slow growth that lasted from the 1920s through the 1960s.

High Tech Boom

The third and most recent wave of sustained economic growth to reach Massachusetts was the high tech boom of the 1970s and 1980s. Recovery from Massachusetts' 50 years of economic dormancy finally occurred when the commercial potential of the state's institutional research base was tapped effectively for the first time. This, combined with relatively low business costs and strong demand from the scientific and defense communities as well as overseas businesses, fueled a burst of high technology growth that peaked in the 1980s. The high tech boom in Massachusetts had its nucleus in the start-up manufacturing firms in the suburbs outside Boston along Route 128. This third boom saw the resumption of net growth in manufacturing jobs in the state.

Service industries also enjoyed unprecedented growth during this period, reshaping downtown Boston and many affluent suburban areas. Much of the growth in services stemmed from the growth in the high tech economic base. However, some service businesses, like mutual funds, banks, and consultants, which served a customer base outside of the state, and universities and specialized medical institutes which drew out-of-state students, patients and research dollars, derived many of their revenues from outside the Massachusetts economy. The service industries thus constituted an important part of the growing economic base.

The era of high tech growth in Massachusetts began a dramatic decline beginning in 1989. In the next 36 months, the Massachusetts economy lost more than 14 percent of its total jobs—many of which were in high-tech-related industries. The causes of this sudden reversal are discussed in detail in the next chapter.

The forces of technological innovation that so rapidly reversed the fortunes of many Massachusetts businesses over the past five years can also propel a more diversified crop of innovative companies to positions of competitive preeminence.

Today's Situation

Statistically, the national recession is already over, but history indicates that this may have only limited influence upon the long-term prospects for sustained growth and job creation in Massachusetts. A more relevant consideration is whether the high-tech boom has ended in Massachusetts, or merely stumbled badly.

If the high tech boom is limited to a group of industries focused on minicomputers and defense, then the answer is probably the former. However, it is also possible that the minicomputer- and defense-dominated high tech boom was merely part of a larger and deeper phenomenon—that is, the successful application of advanced research to an ever-broadening array of commercial opportunities and the creation of an environment supportive of rapid, technologically-based innovation.

It is clear that in our midst new technologies are being developed and new industries are emerging. Traditional industries are experimenting with new production methods. How fast will they grow and will they continue to grow here? Or will many of them ultimately concentrate in other, more favorable, business climates? Is the high tech boom over in Massachusetts, or is it reshaping itself in the form of a new group of internationally competitive, growing businesses?

The National and International Competitive Environment

Companies are Competing...

Virtually all products made and services offered by Massachusetts businesses to out-of-state customers—and many products and services sold within the state—face competition from businesses in other states and nations. Industrial clusters which compete with many of Massachusetts' promising industries are emerging in both industrialized and developing countries. The fate of the minicomputer boom of the 1970s and 1980s was, in part, sealed by this competitive environment. Computers that were better, faster, smaller, and cheaper than those that were the mainstay of some Massachusetts computer firms were developed with astounding rapidity by firms in California and Japan. Today, computers are produced in scores of industrialized and developing countries.

Even "intellectual" products like software are being developed in locations that only a few years ago would have seemed implausible. Digital Equipment Corporation, for example, has located a software development affiliate in Bombay, India. It is clear that Massachusetts does *not* have a world monopoly on brain power. Ironically, many of the Indian software engineers now developing India's software industry are Massachusetts-trained.

What is apparent is that Massachusetts at the close of the 20th century has no more of a permanent edge in advanced technology than it had in commodity manufacturing at the century's beginning.

Competitiveness and State Government

...And So Are States and Nations

Not only are companies competing at a furious pace, but so are states and nations. Every emerging technology industry and high-growth business sector on which Massachusetts might pin its hopes for future prosperity is being sought after by aggressive economic development planners around the world who see the same potential. Business attraction and retention and new business creation are becoming top priorities around the world.

In particular, despite the serious fiscal constraints facing nearly all state governments, business promotion has remained a priority for Massachusetts' primary competitors for high growth businesses. An exhaustive description of the economic development strategies of other states would require a separate volume of this *Strategy*. The following description offers highlights of the programs of several important competitors with a special emphasis upon funding commitments. While these do not reflect the full range of services provided in each state, they do indicate levels of commitment to promoting growth and job creation.

Connecticut recently enacted economic development legislation to complement existing business promotion programs. The state now has a billion dollar loan guarantee program, tax incentives for manufacturers, tax increment financing, and a streamlined permitting process.

The so-called "Credit Crisis Bill" authorized $110 million in state bonding for the Connecticut Development Authority to be used to leverage private lending in four new programs: a Loan Guarantee Fund, a Business Line of Credit, a Capital Access Program and a Regional Corporation Revolving Loan Fund. The net new investment that can be stimulated by these programs is estimated by Connecticut authorities to exceed $1 billion.

Connecticut has also enacted Urban Enterprise Zone legislation. Firms that move to or expand within an Urban Enterprise Zone may be eligible for corporate tax credits, property tax abatement, exemption from certain state sales and use taxes, state grants for the creation of new full-time jobs, job training and placement assistance, and a variety of added local incentives.

Connecticut estimates that its economic development programs and incentives have created or retained 30,000 jobs since 1991.

Pennsylvania. Since Fiscal Year 1988, the Pennsylvania Department of Commerce's economic development programs have invested nearly $1.2 billion in more than 2,000 projects. The five major categories of investment assistance are bond financing programs, small business and other financing programs, technology development programs, marketing programs, and the Governor's Response Team.

Every emerging technology industry and high-growth business sector on which Massachusetts might pin its hopes for future prosperity is being sought after by aggressive economic development planners around the world who see the same potential.

Pennsylvania's Ben Franklin Partnership funds research and development, business/university partnerships and, for small companies, entrepreneurial assistance, seed capital and start-up incubators. Its Industrial Resource Centers provide assistance to manufacturers trying to modernize their management and production processes.

Pennsylvania estimates that these investments have led to the creation of 113,442 new jobs in Pennsylvania and the retention of 99,433 existing jobs since Fiscal Year 1988. Program commitments in Fiscal Year 1992 totaled $264 million.

New Jersey. In 1992, New Jersey established a $224 million Economic Recovery Fund within its Economic Development Authority. Its goal is to create jobs by forging new public/private partnerships and provide new financing opportunities for the state's small and medium size businesses. It is estimated that the Fund will stimulate $800 million in private sector investments and create 20,000 construction and 75,000 permanent jobs over the next three years. The Fund will invest in financing for business, infrastructure projects, cultural and tourism development, school renovation and environmental restoration.

The New Jersey Economic Development Authority (EDA) operates an extensive group of programs. Since 1990, the EDA has arranged $1 billion in financing, representing over 400 projects through the end of 1992. This activity has led to $2.75 billion in investments and an estimated 24,000 additional job opportunities for New Jersey residents.

New Jersey also has enacted an Urban Enterprise Zone Program, which provides benefits such as tax credits, state sales tax exemptions for purchasing building materials and most tangible personal property and services, unemployment tax rebates, skills training programs, possible exemptions from state and municipal regulations, eligibility for reduced utility rates and energy assistance funds for qualified businesses.

California enacted legislation in 1992 to create a consolidated Trade and Commerce Agency. This agency unites economic development programs and functions scattered throughout state government, and will create a single coordinated economic strategy for the state.

California has enterprise zones that provide sales credits on the first $20 million of equipment or machinery purchased, a hiring credit for the first 60 months of wages paid to employees hired through specific programs, and lender interest income deductions for loans made to zone businesses.

California's Competitive Technology Program (Comp Tech) provides matching funds to collaborative research projects at public and non-profit research institutions to

promote development of technologies with commercial potential. To date, Comp Tech has funded 60 projects with $12.2 million in state grant money. The projects include work in areas of biotechnology, agriculture, medical treatment and diagnostics, computer science, electronics, superconductivity, and hazardous waste reduction.

The Role of State Government in Increasing Economic Competitiveness

Massachusetts can respond to this competition and experience the resumption of long-term growth based on the economic potential presently within the state. The forces of technological innovation that so rapidly reversed the fortunes of many Massachusetts businesses over the past five years can also propel a more diversified new crop of innovative companies to positions of competitive preeminence. But it is clear that intense national and international economic competition represents a formidable challenge.

The "Competitiveness Partners". The role of government in increasing state economic competitiveness can easily be understated or overstated. Competitiveness is primarily a private sector phenomenon, but the government does have a clear role to play as one of four key partners. The four "competitiveness partners" are:

- *Private businesses.* The primary responsibility for business competitiveness in Massachusetts rests with Massachusetts businesses. Business managers and owners must make the fundamental decisions regarding investment, location, product development, marketing and hiring which create successful enterprises and, ultimately, grow the economy.
- *Labor.* Few companies can implement innovative business methods, reach new levels of competitiveness, or achieve significant growth without the enthusiastic support of their employees. At the same time, workers are recognizing the importance of company competitiveness to the quality and security of their own employment.
- *The academic and research communities.* Non-profit institutions have traditionally viewed themselves—and been viewed—as distinct from and, in some respects, at odds with the for-profit, commercial economy. It is now clear, however, that institutions of higher learning and research are vital to advanced, innovation-based economies like that of Massachusetts. New legal models are being developed to allow academic and research institutions to cooperate successfully with for-profit businesses while continuing to pursue their noncommercial missions.
- *Government.* The government cannot productively dictate private sector economic decisions to create a more competitive economy, nor can it single-handedly finance an economic recovery. However, the state government has a substantial influence on the climate in which private decisions are made—to invest, to modernize, to expand, to train workers, to create new companies, to commercialize new products, and to export.

The primary roles of government in promoting competitiveness are improving the business environment and encouraging innovation.

The primary roles of government in promoting competitiveness are improving the business environment and encouraging innovation. Characteristics of a favorable business environment include:

- A reasonable and stable tax environment.
- Low government-affected business costs.
- Regulations and regulatory processes that protect the public interest but do not slow time to market or prevent the construction of new facilities.
- Fast and reliable transportation and communications systems.
- An educated workforce.
- A supply of skilled workers and training available to provide needed skills.
- Readily available expertise in efficient management and production practices.
- University and research sectors which provide a stream of ideas for innovative products and services.
- Accessible investment capital and credit.
- Barriers to exporting (including ignorance) are removed.
- A state government which is accessible to businesses at the regional level and a cooperative relationship between local and state government in working for economic development.

How the government can improve the business environment in each of these areas is explored in Chapter 5.

Getting the Biggest Bang for the Buck. In order to carry out a successful economic policy, the state must *act strategically and must leverage its funds.* Big as it may seem, the state government is only a small part of the Massachusetts economy. (The total state budget is approximately $15 billion, compared with an estimated gross state product of over $145 billion). Furthermore, only a fraction of the state budget is available to promote economic development. Given the limited resources available, it is vital to wring the maximum economic development impact out of all the state's resources. The following strategies outline the basic leveraging approaches. In order to maximize its influence, the Commonwealth should:

- *Articulate a clear economic vision.* One of the state government's most potent—and cost effective—means of influence is its ability to participate prominently in public discourse over key issues. Government should encourage an entrepreneurial culture by clearly emphasizing the imperatives of national and interna-

tional competition, highlighting the challenges facing businesses seeking to expand, and articulating an economic vision for the future. Preparation of this *Strategy* is a clear example of this approach.

- ***Promote coordination and communication within business sectors.*** The Governor's Council on Economic Growth and Technology, established by Governor Weld in 1991 and chaired by Daniel Gregory, has provided a rich supply of advice and ideas for the Governor and other state policy-makers. It has also improved communication within several industry sectors regarding what steps the companies themselves can take to improve the competitive environment for their industries in Massachusetts.
- ***Target resources to where the needs and potential return are greatest.*** This approach is particularly relevant to addressing the needs of distressed areas of the Commonwealth. Businesses will not be induced to grow in these areas unless true preferences are created, such as those provided by economic opportunity areas. Targeting is not only necessary to achieve results, but it is appropriate because the state's joblessness is concentrated in these areas.
- ***Build on and reinforce the established and emerging industry concentrations.*** Doing this leverages institutional and government investments in building skills, research capabilities, and infrastructure because they support whole groups of firms and industries. Government efforts to promote new industries should build on existing and nascent clusters, not try to create new industries from scratch which are disconnected from other areas of local strength.
- ***Choose actions that accomplish multiple objectives.*** State agencies pursuing agendas that are not explicitly related to economic development should be sensitive to opportunities to boost economic activity and growth. Examples of such opportunities include energy conservation and toxic use reduction, which can improve industrial efficiency while achieving environmental goals. Other examples include the location of state operations to support redevelopment goals, as was done in the location of the new motor vehicles registry at Ruggles Center in Roxbury.
- ***Create rules, regulations, and incentives that encourage innovation and upgrading.*** Constant innovation is fundamental to maintaining business competitiveness. Government policies affect innovation in a wide variety of areas. Through regulations, tax policies, export promotion strategies, and standards for product performance, safety and environmental impact, government policies influence the framework within which firms compete and can encourage product development.

State agencies pursuing agendas that are not explicitly related to economic development should be sensitive to opportunities to boost economic activity and growth.

- ***Choose visible actions with broad influence.*** Given a choice between inducing a company that is an industry leader to expand in Massachusetts—influencing other companies in the same industry facing the same decision—and using the same resources to buy jobs without any broader impact, state government should clearly choose the former.
- ***Seek private partners wherever possible and leverage private or federal resources.*** When making investments, the state should share risk with private partners. It is seldom necessary for the government to assume more than a fraction of the financial burden or risk in order to induce worthwhile private economic activity. The advantage of this practice is that it sets many minds—and more than one perspective—to work in assessing the economic risk and value of an investment, loan, or other assistance.
- ***Use mechanisms designed to assure that state assistance will have a significant impact, and will not be simply accepted because it is "free".*** This is a particular challenge for technical assistance and training programs. The creation of structures that encourage cost sharing would force private recipients of state assistance to bear at least some program costs. Other mechanisms are possible as well, such as requiring commitments by companies receiving job training assistance that they hire the participants who have completed the training program successfully and meet minimum standards.
- ***Focus on transitional programs and create private-sector successors.*** State economic development programs should be designed to catalyze change in private markets. There should be a clear understanding regarding how private sector mechanisms will replace state assistance programs within a reasonable time. An example would be the use of partial loan guarantees to induce private lenders to begin lending to a particular sector, rather than establishing a substitute form of state financing.
- ***Work to improve programs with broad impact on business.*** Relatively small improvements in programs with almost universal impact on businesses or business expansions can have substantial aggregate benefits for the economy. Into this category fall heavily regulated or publicly managed insurance programs (e.g. unemployment insurance, workers' compensation, and health insurance) and regulatory programs in areas such as environmental protection and banking.

Chapter 3 The Massachusetts Economy Today

THIS CHAPTER has three sections: an overview of the basic characteristics of Massachusetts and its regions, an analysis of its economic growth and decline over the past 15 years, and an assessment of the present economic strengths and weaknesses of the state and its regions.

A SOCIO-ECONOMIC OVERVIEW OF MASSACHUSETTS AND ITS REGIONS

The Commonwealth of Massachusetts

Despite its small geographic size, Massachusetts is a state of great diversity. The Commonwealth contains major cities, colonial villages, historic mill towns, rustic farmlands, high tech industrial parks, and advanced research laboratories. The state has a rich cultural life and diverse population. The beaches, small seaports and several major harbors which line the Commonwealth's coast contrast with the dense woodlands which cover its northern tier. The Appalachian mountain range traverses the state's western area, while the middle of the state is graced by lakes and river valleys. Within this environment, the people of Massachusetts have created a way of life that is both immersed in tradition and open to innovation.

Given Massachusetts' diversity, it makes sense to examine the Commonwealth's society and economy in smaller units. For the purposes of this Strategy, the state has been divided into seven regions: Berkshire, Pioneer Valley, Central, Northeast, Greater Boston, Southeast, and Cape and Islands.

Berkshire Region

The Berkshire Region balances rustic charm with modern manufacturing industries such as plastics, machinery and defense. The region has managed to maintain much of its old charm and Yankee character. Endowed with natural beauty and a wealth of cultural attractions, the Berkshire Region is a major tourist destination and second home area. Pittsfield is the region's largest city and primary economic and population center. A detailed analysis of the Berkshire Region is given in Chapter 9.

Pioneer Valley Region

The Pioneer Valley Region has been a manufacturing center since the 1800s, making everything from ammunition to bicycles and automobiles. It also has a large cluster of higher education institutions that attract students from all over the country. Springfield, the region's largest city, is the major center for insurance and financial services in the western part of the state and is home to many nationally known, old-line manufacturers. A detailed analysis of the Pioneer Valley Region is given in Chapter 10.

Central Region

The Central Region is a highly diversified manufacturing center which has recently been branching out into leading-edge industries such as biotechnology and fiber optics. The plastics industry got its start in Leominster, which is still home to over 100 manufacturers of plastic products. Worcester, the second largest city in New England, has become a regional center for health care services and biotechnology research and development. A detailed analysis of the Central Region is given in Chapter 11.

Northeast Region

Over 150 years ago, the mills along the Merrimack River helped to usher in the industrial revolution in the United States. Today, the Northeast Region is a national and international center for computers, telecommunications and military technology. The region's two largest cities are the major industrial centers of Lowell and Lawrence. A detailed analysis of the Northeast Region is given in Chapter 12.

The Massachusetts Economy Today

Greater Boston Region

The Greater Boston Region is the largest and most diverse region of the Commonwealth. With its extraordinary collection of educational institutions, financial service companies, hospitals and medical research institutions, and leading advanced technology companies, Greater Boston possesses resources that are virtually unparalleled in the nation. The City of Boston is the financial capital of New England, and a major urban and political center. A detailed analysis of the Greater Boston Region is given in Chapter 13.

Southeast Region

The Southeast Region is home to a number of traditional industries, such as textiles, footwear, and fishing, which were part of the historic growth and development of the Commonwealth. In recent years, these businesses have been supplemented with manufacturers of electronic and communications equipment, and a growing marine science industry cluster. A detailed analysis of the Southeast Region is given in Chapter 14.

Cape and Islands Region

The region encompassing Cape Cod and the Islands of Martha's Vineyard and Nantucket has unique geographic characteristics that set it apart from the state as a whole. Its beaches and scenic wetlands represent an environment that is highly attractive to tourists from around the world, as well as to retirees and summer-home residents. Because of the fragility of the region's natural environment, however, careful planning is necessary to balance economic growth with environmental preservation. A detailed analysis of the Cape and Islands Region is given in Chapter 15.

Population Characteristics

In 1990, the Commonwealth of Massachusetts was home to 6,016,425 residents. Population density varies considerably among the state's seven regions. As Figure 3A illustrates, Greater Boston comprises nearly half of the state's population, while the Berkshire and Cape and Islands Regions each have less than a 4 percent share. Massachusetts' population increased by 4.9 percent between 1980 and 1990. Figure 3B shows rates of population change by region. While the Cape and Islands, Central and Northeast Regions experienced strong population growth, the Berkshire population contracted by 4 percent and Greater Boston remained essentially static. The Pioneer Valley and Southeast Regions both posted modest population increases over the same period. Population change between 1980 and 1990 for individual communities is shown in Figure 3C.

Race

A closer examination of Massachusetts' population reveals that it is 86 percent white, 4.7 percent black, 4.4 percent Hispanic and 4.9 percent other minorities. The state's minority population grew from 7.7 percent to 9.9 percent of the total population between 1980 and 1990.

The Commonwealth's black population is heavily concentrated in Greater Boston, the Pioneer Valley and the Southeast. Large regional Hispanic populations exist in the Northeast, Pioneer Valley and Greater Boston regions.

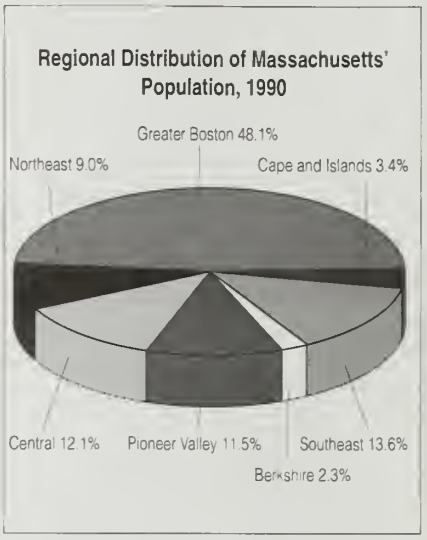

Figure 3A

Massachusetts' Asian, American Indian and other smaller minority populations are concentrated in the Pioneer Valley, Northeast and Greater Boston. These regional race distribution statistics reflect sizeable minority populations in the major cities of Boston, Lawrence, Lowell, Springfield and Worcester.

Per Capita Income and Poverty

In 1991, average per capita income was $22,897, down significantly in real terms from 1989, but the third highest of any state and still much higher than the US average of $19,082. There is significant variation in income levels and income growth by region. As illustrated in Figure 3D, 1989 average per

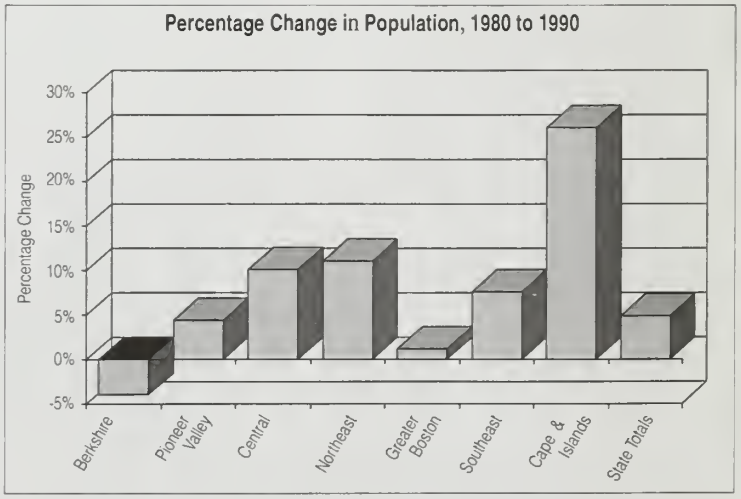

Figure 3B

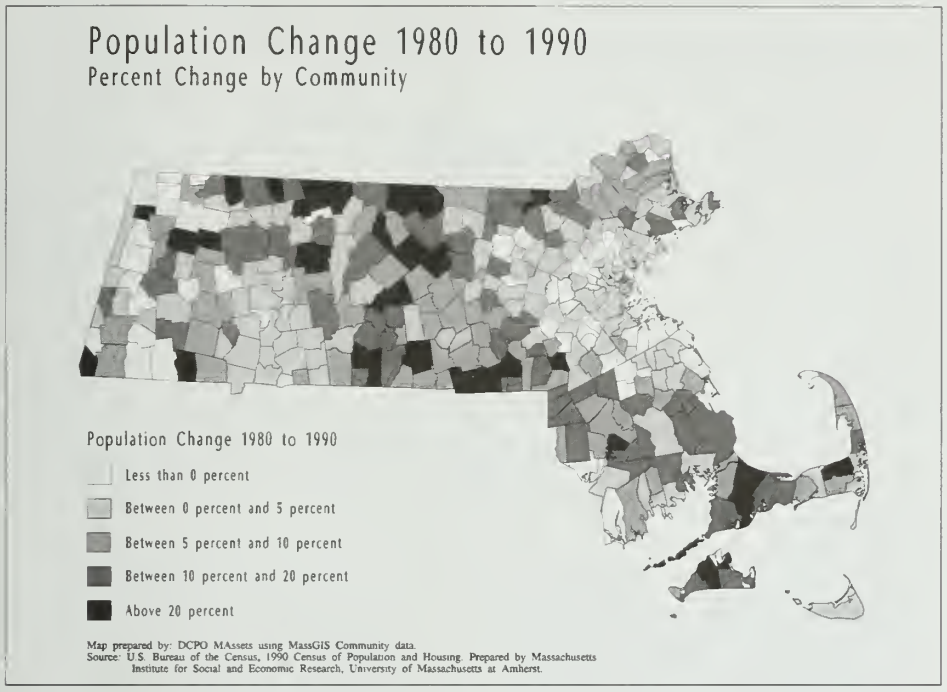
Population Change 1980 to 1990
Percent Change by Community
Population Change 1980 to 1990
Less than 0 percent
Between 0 percent and 5 percent
Between 5 percent and 10 percent
Between 10 percent and 20 percent
Above 20 percent
Map prepared by: DCPO MAssets using MassGIS Community data.
Source: U.S. Bureau of the Census, 1990 Census of Population and Housing. Prepared by Massachusetts Institute for Social and Economic Research, University of Massachusetts at Amherst.

Figure 3C

capita income ranged from a high of $19,542 in the Greater Boston Region to a low of $14,114 in the Pioneer Valley. Greater Boston and the Pioneer Valley also marked the extremes with respect to real income growth between 1979 and 1989.

There is also significant variation in the percentage of persons living below the poverty level by region. Although the statewide average was 8.9 percent, poverty rates ranged from highs of 12.1 and 10.1 percent in the Pioneer Valley and Northeast to a low of 7.4 percent in the Cape and Islands (see Figure 3E). Poverty is most severe in the communities of Chelsea, Holyoke, Lawrence and Springfield, and in much of Boston.

Per Capita Income by Region

	Per Capita Income 1989	Real Change 1979-1989
Berkshire County	$14,857	21.1%
Pioneer Valley	$14,114	18.2%
Central Mass.	$15,529	25.7%
Northeastern Mass.	$16,407	30.3%
Greater Boston	$19,542	33.1%
Southeastern Mass.	$14,241	25.9%
Cape Cod & Islands	$16,633	23.6%
State Totals	$17,224	28.8%

Figure 3D

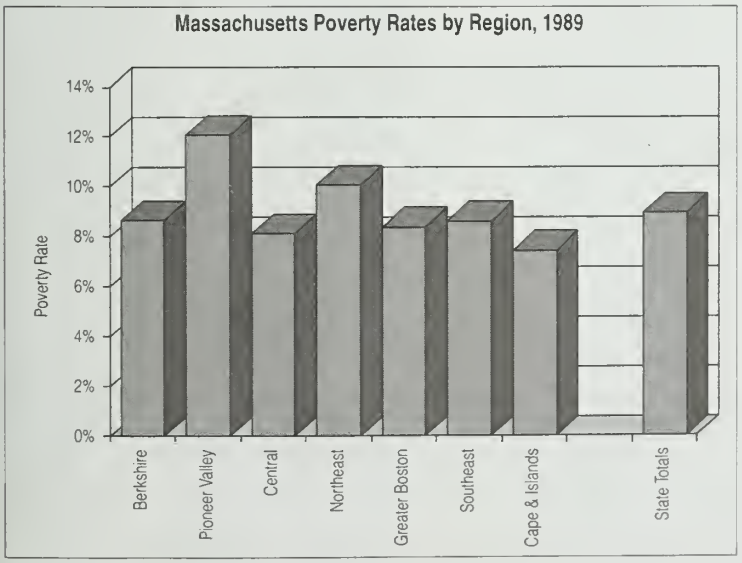

Figure 3E

Education and Workforce Skills

The state benefits from a highly educated workforce that has seen sharp improvements in educational attainment over the past decade. The proportion of Massachusetts residents over the age of 25 who have attained a bachelors degree or better increased from 20 percent in 1980 to 27.2 percent in 1990, the highest rate in the nation (see Figure 3F). The percentage achieving high school graduation improved from 72.2 percent to 80.0 percent over the same period.

Owing to its diverse industrial base, the Commonwealth's labor force has a wide array of occupational skills. One of the distinctive strengths of the Massachusetts workforce is its over one million workers with professional, management and technical skills. Economic restructuring has had a major impact upon the occupational mix of the workforce. The contraction of manufacturing is reflected in the steep decline of machine operator jobs, falling by nearly 100,000 between 1980 and 1990. The rise of high tech and sophisticated service industries is reflected in the increase in the number of technicians, professionals and managers, which increased by nearly 300,000 in the same period.

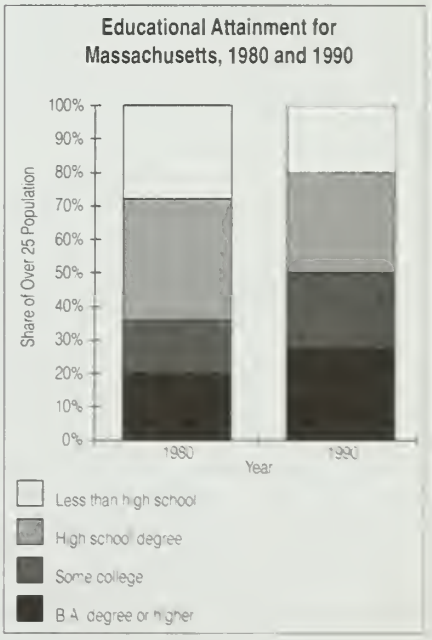

Figure 3F

The Massachusetts Economy Today

THE MASSACHUSETTS ECONOMY: A CLOSER LOOK AT THE PAST FIFTEEN YEARS

From Miracle to Mire

Despite its underlying strength and diversity, the Massachusetts economy is experiencing an exceptionally severe downturn following years of growth. Since the end of 1988, the one-time "Massachusetts Miracle" economy has shed nearly 400,000 jobs — or one out of every eight positions. This is the most severe per capita loss of any state in the recent recession and the largest loss of jobs in Massachusetts since the Great Depression. Although signs of recovery are beginning to emerge, the economy still staggers under an unemployment rate substantially above the national average (see Figure 3G). Defying favorable interest rates and the predictions of many economists, overall growth is weak, and statewide job creation remains anemic (see Figure 3H). Long-term prospects for job growth are uncertain.

Despite the fact that the Massachusetts economy began losing jobs over four years ago, there remains considerable uncertainty among both ordinary people and political opinion leaders over what really happened. How did the bloom come off the rose — and how did it happen so quickly? More importantly, what happens now? This section takes a closer look at the strategic position of the state economy by examining in greater depth the forces that have driven growth and decline over the past two decades.

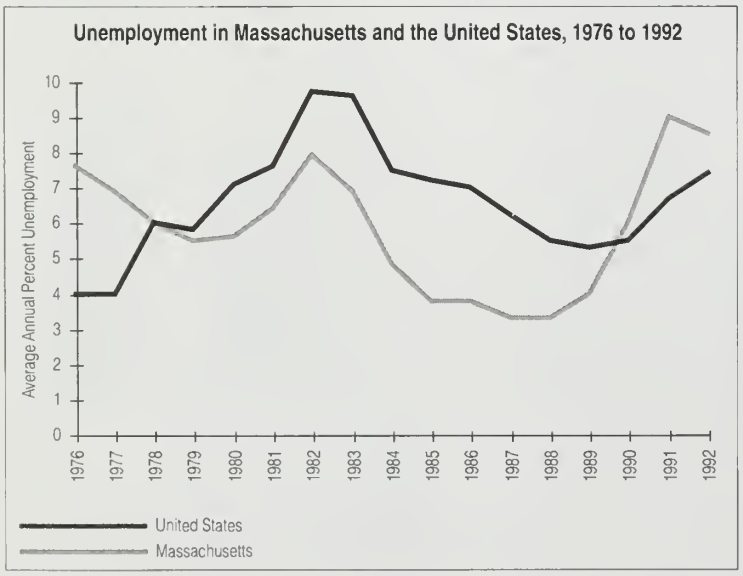

Figure 3G

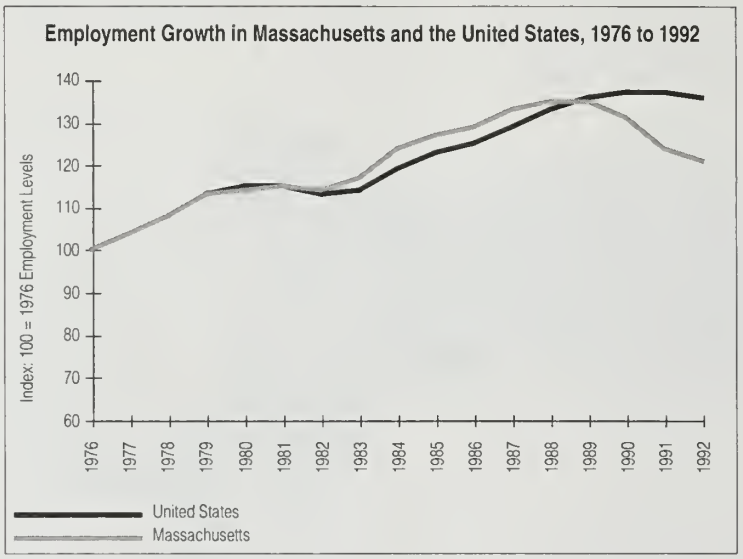

Figure 3H

A Classic Cyclical Recession?

Like most previous economic downturns, the post-1988 recession has been due, in part, to the "normal" business cycle which has caused a contraction in national and global demand for Massachusetts goods and services. In business cycle theory, periodic recessions are, in fact, necessary to "cool down" an overheated economy and "squeeze out" excessive wage and employment inflation. In theory, the classic cyclical recession comes to an end when consumer confidence turns upward, excess housing stock is absorbed, debts are retired, inventories are used up, and business costs fall more closely into line with those in other nations and regions. Federal monetary policy can help this process by establishing lower interest rates that stimulate investment and consumption. In response to increased demand, businesses would begin hiring back laid off workers. These newly-enriched consumers would, in turn, fuel further consumption, and an upward spiral of growth would result. If Massachusetts were experiencing a strictly cyclical recession of this sort, recovery might take some time, but it would inevitably occur.

The Structural Hypothesis

The Commonwealth's current distress cannot be simply attributed to cyclical factors, however. Since the economy began shedding jobs in January of 1989, economists have repeatedly misjudged the depth of the downturn and been premature in their recovery projections because low interest rates, debt retirement, and inventory depletion have failed to stimulate consumption or rehiring as would normally be expected. Instead, it appears that throughout the period from 1976 to the present, the economy has been restructuring due to forces that transcend the business cycle. The intensity of this recession and atypical character of the recovery are due to two underlying structural revolutions which have altered Massachusetts' competitive position and now challenge its economic future.

The First Revolution: Productivity

Since the late 1970s, there has been exploding progress in the application of information technology and new management methods to all sectors of the economy. This has led to rapid gains in productivity and accelerated product innovation and development.

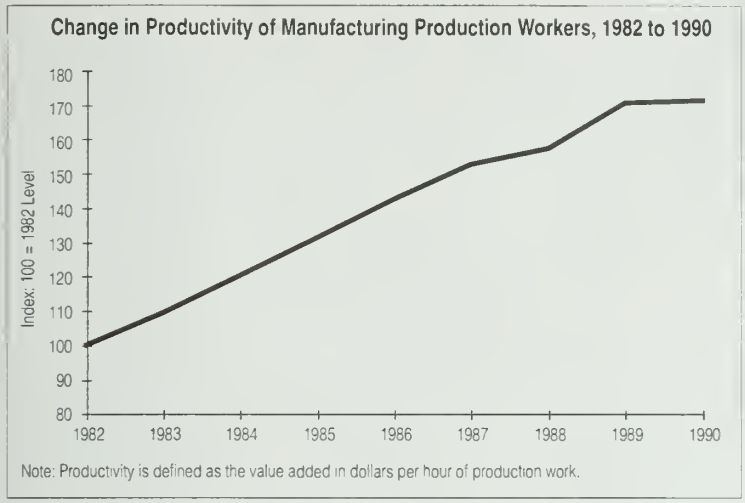

Figure 3I

- Manufacturing automation, flexible production, just-in-time inventory and new management systems are making firms more efficient.
- Clerical workers are being replaced with personal computers and automatic telephone systems.
- Middle managers are being shed as new management techniques and computers render them unnecessary.

As illustrated in Figure 3I, the hourly productivity of Massachusetts production workers in manufacturing industries increased by over 180 percent between 1977 and 1990. The net result is that the same output — whether of products or services — can now be generated with fewer workers. The application of information technology and robotics to an ever-increasing array of tasks will ensure that this process continues. Since 1987, the cost of an average worker, including wages and benefits, on a nationwide basis has risen more than 17 percent compared with the average price of new business equipment. Given the emphasis being placed upon cutting costs in order to compete, we can be sure that businesses will be eager to invest in labor-saving technologies.

From a strictly business perspective, these developments should be applauded because they indicate that Massachusetts firms will be lean or more efficient and better able to compete. From a socio-economic perspective, however, rising productivity can impose a number of problems. Full employment is difficult to achieve when the labor needs of business are not growing, or are actually declining. It is also difficult to achieve growth-producing consumption without significant increases in total payroll. After a decade and a half of unprecedented productivity gains, we are now faced with a situation where Massachusetts industry is returning to pre-recession production levels and is beginning to post impressive output growth figures, but is doing so without significant net new hiring.

The Second Revolution: Global Competition

Since the mid-1970s, advances in information technology, transportation and multilateral trade negotiations have transformed the global business environment. Major competitors to the U.S. economy have emerged in Asia and Europe and are emerging in parts of Latin America. Many industrializing nations have modernized their economies through economic strategies expressly based on maximizing exports to the affluent, industrialized countries of North American and Europe. Information, capital, goods and services flow more freely around the world now than just fifteen years ago.

- Money deposited in a Massachusetts bank, venture capital fund or mutual fund may very well be used to create new factories or new firms in Singapore, Germany or Mexico, rather than in Waltham or Worcester.
- Technological breakthroughs in a Cambridge laboratory may easily end up being applied to new products made in Osaka, rather than in Attleboro.
- Long-time local customers of Massachusetts firms may suddenly find themselves offered higher quality or lower cost goods — and services — by Italian or Filipino firms, and discover that shipment can be made overnight, or even instantaneously.

Figure 3J reflects the huge increase in the volume of imports and exports moving through the customs port of Boston over the past decade. Massachusetts companies have become subject to ever-growing competition from foreign competitors. Success is no longer a matter of simply beating out local competitors. As shown in Figure 3K, the level of investment by foreign companies in Massachusetts grew precipitously between 1981 and 1989. In today's global environ-

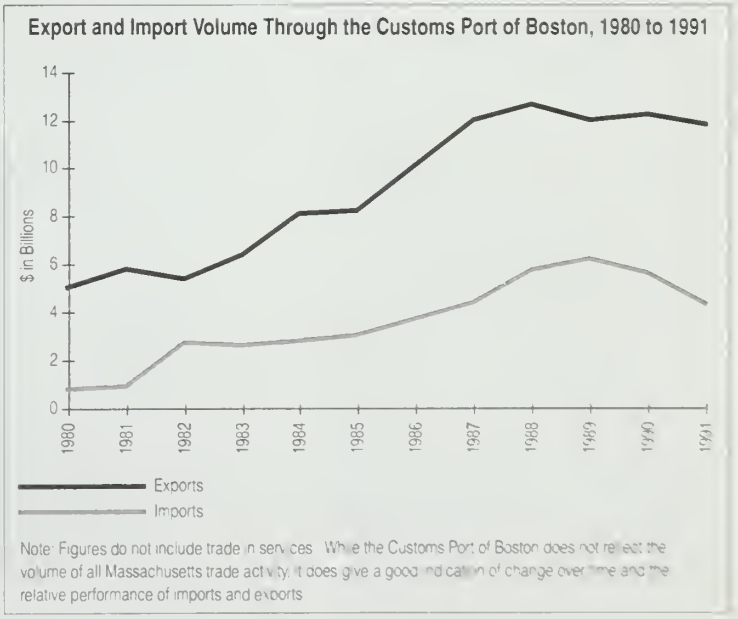

Figure 3J

The Massachusetts Economy Today

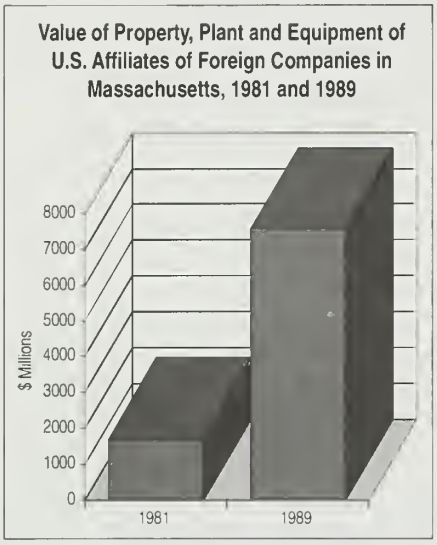

Figure 3K

ment, firms must be prepared to fight on even terms with elite European and Asian companies for their traditional domestic marketshares and to actively pursue foreign market penetration themselves. While global market transparency does impose unsettling challenges upon many Massachusetts firms, it also opens up new opportunities. Between 1987 and 1991 alone, Massachusetts exports grew by over 42 percent to reach a level of $11.3 billion annually.

The impact of these two revolutions can be clearly observed in the economic performance of the Commonwealth over the past decade and a half.

The Mid-1970s Through the Mid-1980s

Riding the Information Technology Boom

In the period from 1976 to 1984, Massachusetts saw strong growth in its economic base. The primary basis for this growth was the success of the Commonwealth's high tech industries which stood at the frontline of the information technology revolution. Fueled by the emergence of the microprocessor as a product with widespread commercial and industrial applications, high tech manufacturing in the Commonwealth grew rapidly through the early 1980s (see Figure 3L). Producers such as Wang Laboratories, Digital Equipment Corporation, Honeywell, Lotus and a host of electronics firms rode the initial information revolution juggernaut to industry leadership.

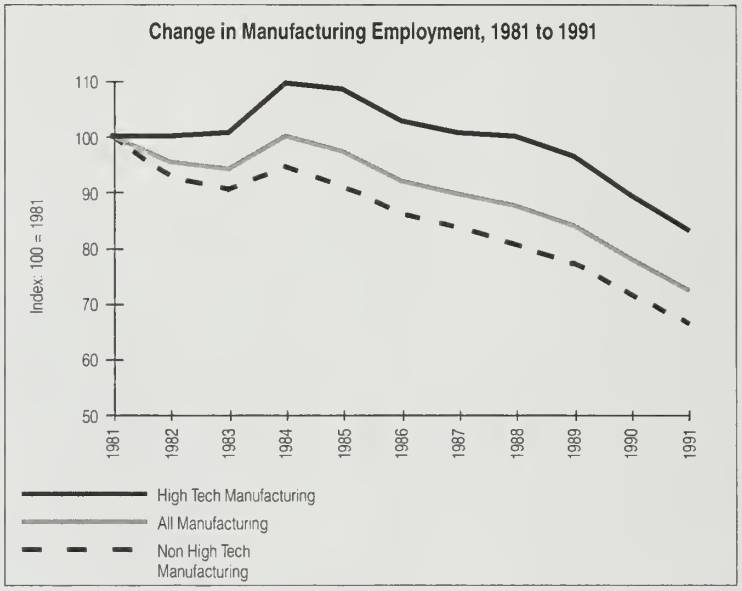

Figure 3L

Massachusetts' defense industry success was also largely predicated upon the information revolution. Both the Carter and Reagan military build-ups emphasized sophisticated, high tech weaponry. Advances in information technology had unlocked tremendous new military potential and Raytheon, General Electric, and other Massachusetts defense contractors used their technological sophistication to seize a large share of federal defense appropriations (see Figure 3M). During this period of high-tech-driven growth, the special competitive advantages associated with Massachusetts' first-class university and research base came into their own as a competitive advantage. Massachusetts' strengths in skilled labor and innovative research allowed local businesses to grow and attracted a number of out-of-state firms.

Added to the high tech manufacturing strength of this period was the substantial growth of certain service industries, such as banking, mutual funds, higher education, and some business services. As seen in Figure 3N, employment grew in finance, insurance, and real estate (FIRE) industries by 12.6 percent between 1980 and 1984. Business, health, and educational services grew by 18.9 percent in the same period. Much of this growth can be attributed to the information revolution as well. The advent of computer applications transformed the capacity and productivity of these industries, allowing them to enter new business areas and offer new service products.

Reaping the Advantages of Growing Market Transparency

The growth sectors of the Massachusetts economy also benefitted from strong export-driven growth. The non-local export component of the Massachusetts FIRE and services sectors, for example, has been esti-

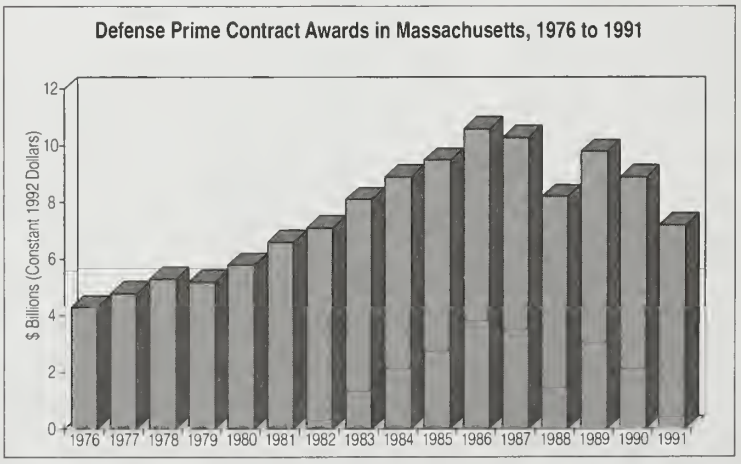

Figure 3M

mated to account for about 30 percent of total employment in these sectors. Financial services firms like Fidelity were able to attract customers from across the country and abroad and became important actors in international finance. The Commonwealth's information technology manufacturers also derived much of their growth from foreign markets. Digital, for example, became the second-largest producer of computer equipment in Europe.

Decline in Traditional Manufacturing

In the period from 1976 to 1984, the structural forces at work had generally positive results for the state economy. Even at this early stage, however, the two revolutions were causing employment losses in some important Massachusetts industries. Simultaneous with the expansion of high tech manufacturing and services, there was a gradual and largely unobserved decline in employment in traditional areas such as machinery, metalworking, textiles and paper. Automation, computerized inventory and quality control systems dramatically reduced the number of workers needed to produce the same amount of output. At the same time, older Massachusetts manufacturers were being forced out of business by the penetration of their traditional markets by low-cost competitors from Taiwan, Hong Kong, and Korea. As illustrated in Figure 3L, non-high-tech manufacturing employment fell by 23,300 (5.5 percent) in the 1981 to 1984 period alone. The resulting redundancies were offset by gains in the high tech areas, however, and therefore attracted little attention.

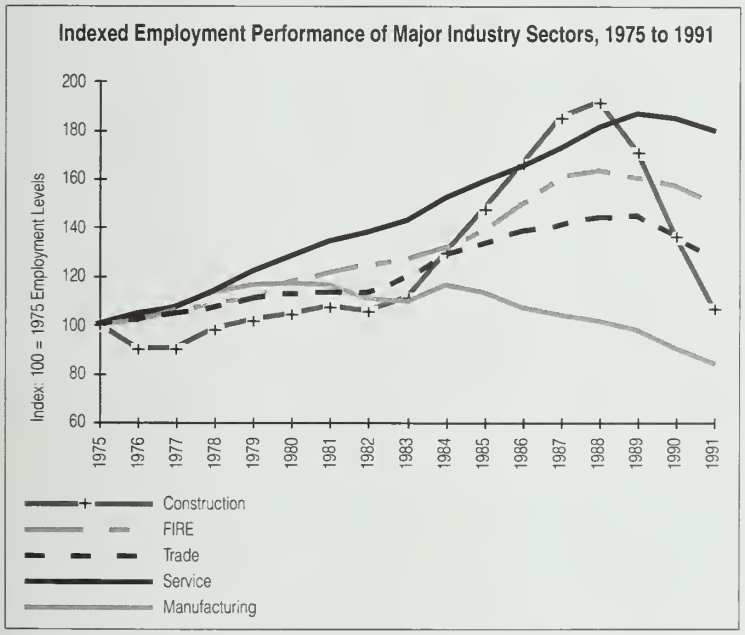

Figure 3N

The 1985 to 1988 Period

A Reversal of Fortunes

In the late 1980s, the Massachusetts base economy became more exposed to the dislocating effects of the two structural revolutions. Significant parts of the Massachusetts high tech industry fell behind the innovation curve. The minicomputer industry, in particular, failed to keep pace and was overtaken by newer technology, developed and built elsewhere. The business environment was also becoming markedly more competitive, both nationally and internationally. Whereas the Commonwealth's high tech firms had once been able to access out-of-state and foreign markets virtually unopposed, the same firms soon found themselves facing stiff competition — not only in foreign markets, but in national and local markets as well. Computers from California and Japan which were comparable or superior in performance and cost to Massachusetts products began to show up in offices throughout the Commonwealth. Capability in information technology spread quickly and the head start which Massachusetts firms had enjoyed in the 1976 to 1984 period was quickly evaporating. For some businesses, this meant shrinking market share. For others — such as Honeywell — it meant being bought out by foreign competitors. By 1988, high tech employment in the Commonwealth had fallen from its 1984 peak by nearly 9 percent (see Figure 3L).

Continued Restructuring in Traditional Manufacturing

The rate of employment attrition in the Commonwealth's non-high tech manufacturing industries accelerated in the 1985 to 1988 period as well (see Figure 3L). Automation and other technology-driven improvements continued to be implemented, further reducing the employment needs of many leading firms. Other traditional manufacturers could not afford or were otherwise unable to institute these technological improvements and faced competition in price and quality. Many were forced to retreat from mass consumer and commodity production to more specialized and smaller-scale niche manufacturing. This process brought with it large-scale downsizing in many firms across the state. As a result, non-high tech manufacturing employment fell by an additional 15 percent from 1985 to 1988.

Speculative Forces Replaced Strength in the Fundamentals During the Late 1980's

All told, total manufacturing employment decreased by 92,000 between the end of 1984 and 1988, marking a dip of over 14 percent. The full extent of the post-1984 manufacturing decline was not recognized during this period, however, because of job gains in construction and related industries (see Figure 3N). Construction employment gains of nearly 46,000 coupled with related gains of 91,000 in strictly local industries such as wholesale and retail trade, transportation, and public utilities, served to divert attention away from the erosion of the Commonwealth's base industries.

The 1989 to 1992 Period

The Negative Side of Structural Change

Between September 1988 and September 1992, the state suffered job losses totaling over 395,000. Part of this dramatic drop came as a result of the national and global

recessions, which caused demand for Massachusetts products to deteriorate. The defense sector, a Massachusetts manufacturing staple, saw employment drop steadily after the end of the Cold War. Underlying these developments, however, was the continuing pressure of the structural revolutions throughout the Commonwealth economy. The negative effects of structural change had up until that point been hidden, first by the high tech/defense boom and later by the construction boom. The 17 percent decline in both high tech and non-high tech manufacturing between 1988 and 1991, however, brought the negative side of the structural changes to public attention.

Crisis in Local Industries and Banking Community

The distress of the Commonwealth's base industries (those business sectors selling products or services largely to out-of-state customers) was compounded by a collapse in a number of local industries (business sectors serving primarily in-state customers). Pushed to unsustainable heights by the speculative real estate boom and debt-driven consumption of the late 1980s, the bottom fell out from under these firms in 1989 when the real estate markets became saturated and problems in the base economy finally surfaced (See Figure 3N). Wholesale and retail trade employment declined by 100,000 between the fourth quarter of 1988 and the fourth quarter of 1991. The construction industry shed over 44 percent of its total employment (63,920 jobs) over the same period, while employment in the real estate industry declined by 23.8 percent.

In addition to their direct impact upon employment in the Commonwealth, the misfortunes of the real estate and construction sectors had an adverse effect on the state's base industries as well. With the abrupt saturation of the property markets due to over-development and the cessation of demand growth, many banks found their portfolios burdened by non-performing real estate loans. This forced banks to consolidate their positions, and diminished the amount of lending capital available to help Massachusetts' struggling base industries. As a result, firms attempting to adjust to the pressures imposed by productivity gains, intense international competition and the recession were unable to gain access to the fresh capital which would have made this process easier.

Poor Consumer and Business Confidence

After the onset of recession in 1989, consumption plunged. A pervasive sense of insecurity gripped Massachusetts, causing people to reduce their expenditures and delay large purchases. Businesses were hesitant to place new orders to increase production, relying instead on existing inventories. Temporary help was taken on to fill immediate needs, rather than new full-time workers. Furthermore, the state's fiscal disarray and unpredictable tax environment dissuaded many large employers from making new investments and plant expansions in the Commonwealth. These factors contributed to the economy's other problems and served to further suppress employment.

1993: THE MASSACHUSETTS ECONOMY TODAY

In 1992, Massachusetts posted an annual average unemployment rate of 8.5 percent — marking a slight improvement in the state's employment picture since the previous year's rate of 9.0 percent. Job creation remains anemic, although some Massachusetts firms have reported new hiring for the first time in years. A recent strengthening of business confidence reflects a widespread belief that the long-awaited recovery is finally taking hold. Improvement in consumer optimism can meanwhile be discerned in rising retail sales figures. The local banking community appears to have regained its equilibrium — with some banks announcing major new lending programs. These private sector improvements have been matched by developments in the public sector. Most notably, the Weld-Cellucci Administration has, after two years of remedial action, stabilized the Commonwealth's fiscal situation and substantially improved its bond rating.

Continued Interaction of the Two Structural Revolutions

Although the economy is finally beginning to show signs of improvement, the revolutions in productivity and global competition will continue to set the context for any future upturn. Rising productivity will continue to depress employment figures and place strong demands upon firms to train, invest and innovate. The anticipated ratification of the North American Free Trade Agreement (NAFTA) accord and agreement at the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) will most likely enhance global market transparency and international economic competition in the coming years. This environment will present opportunities to Massachusetts firms to expand their markets, but will also expose them to unprecedented international competition. The two revolutions will make achieving a strong and sustained recovery a formidable task.

In the face of these challenges, it is necessary for business and government to define a long-term economic vision for the Commonwealth and then set out to achieve it. This vision must be founded upon a realistic assessment of our competitive strengths and weaknesses that will help us understand what the state's economy will need to secure a robust and prosperous future.

Strengths of the Massachusetts Economy

The underlying strengths and weaknesses of the Massachusetts economy can be best evaluated by combining an examination of broad economic trends with a more detailed examination of industry clusters and individual companies. Collectively, these analyses present a picture of the distinctive strengths of the Massachusetts economy. They also highlight areas of weakness that must be addressed.

The sources of strength in the economy include the following:

Strong Educational and Research Capabilities. The Commonwealth has world-class educational, medical, and

research institutions that attract students, scientists, and experts who are at the leading edge of their fields. In 1990, the 120 public and private colleges and universities located in Massachusetts educated 12 percent of the nation's Ph.D. students in computer engineering, 7 percent of those in electrical engineering, and 10 percent of those in mathematics. Fifty percent of all Nobel Prize winners in the United States have been affiliated with Massachusetts educational institutions. In 1989, 5.7 percent of all research and development expenditures nationwide were made in Massachusetts, almost double the Commonwealth's share of national Gross Domestic Product. Massachusetts' universities and research centers serve as the engine which drives growth and innovation in the state's industries through the transfer of technology from R&D to product development and manufacture.

Highly Skilled Workforce. The Commonwealth enjoys a unique pool of highly qualified professionals and highly skilled technicians. Massachusetts leads the nation in the percentage of adults with college degrees and ranks second in the percentage of residents with advanced degrees in science and engineering. Although Massachusetts wage rates are high, the skill levels of its labor force are reflected in labor productivity rates that substantially exceed national norms and compensate for high labor costs.

Leading Positions in Emerging Technologies. Promising Massachusetts businesses are competing in a number of emerging technology sectors which can drive growth and underpin the region's prosperity well into the future. The strong technology and skill base located here provides the flexibility to develop even more industries as new markets emerge. The Commonwealth can draw from its strong pool of educated labor and research resources to become a leader in such emerging industries as biotechnology, environmental sciences, and advanced materials.

Successful Industry Clusters. Many of the core business clusters in the state, such as health care, information technology, and "knowledge creation", would be the envy of most nations. Growth forecasts by industry sector indicate that many are expected to be among the fastest growing sectors of the national and world economy. Even in relatively mature industries, our firms compete in the high end of their market with advanced technological capabilities.

A Broad-Based Economy. The diversity of potentially growing industries in Massachusetts represents another important source of possible future strength. The collapse of the high tech boom in 1989 showed the vulnerability of the economy to conditions in two major industries — mini-computers and defense. The new economy that is emerging in Massachusetts — and which will grow given the right business environment — reflects a broader cross-section of advanced technology industries.

Although Massachusetts wage rates are high, the skill levels of its labor force are reflected in labor productivity rates that substantially exceed national norms and compensate for high labor costs.

Locational Advantage. Massachusetts has an advantage in its proximity to major population centers and markets; access to these markets is further facilitated by the state's strong network of highways. The Commonwealth also benefits from its proximity to European markets. As the United States' closest port to Europe, Boston gains a day in shipping time over other major east coast ports.

Quality of Life. Even beyond its position as perhaps the world's leading intellectual center, the Commonwealth benefits from a rich history, a strong cultural life, and rivers, lakes, mountains, seacoasts and a unique New England character. These attributes play an important role in attracting highly skilled employees to Massachusetts and must also be ranked among the state's most valuable strengths.

Challenges Faced by the Massachusetts Economy

Despite its strengths, the Massachusetts economy faces real and serious challenges. Overcoming these challenges is critical if the state is to enjoy significant new job creation and sustained long-term growth.

Upheaval in Two Major Massachusetts Industries. Restructuring in the defense and minicomputer industries has left many highly skilled workers unemployed or at risk of being unemployed. The challenge this poses is the potential that these skills will be forever lost to the economy as workers retire permanently from the workforce or leave the state. The management of the transition created by the rapid decline of these two industries is a key public policy priority for the Commonwealth.

A Reputation for Unresponsive Government. The Massachusetts government has traditionally constrained the state's economic growth because it has too often been unsupportive of business needs. The effect on the economy is illustrated by past failure to gain consensus on important initiatives and the absence of incentives and support mechanisms for Massachusetts-based companies. Too often, the Commonwealth has been complacent in the creation of a business climate conducive to long-term growth.

Poor Image with Business. Massachusetts has historically been viewed as a difficult place in which to do business, both by firms located within the state and by those based elsewhere. High taxes, poor labor-management relations, a perception of excessive regulation that failed to take industry needs into consideration, and inconsistent government policies have created this perception, and have limited the state's ability to attract new businesses.

The Massachusetts Economy Today

Logan Airport gives Massachusetts access to the world, but can itself be hard to access. The Commonwealth is undertaking several major projects to create better access to Logan for all Massachusetts residents and businesses. *Photo courtesy of Raytheon.*

High Cost of Doing Business. The cost of doing business in Massachusetts is higher than in many other states in the nation, particularly in terms of product inputs and labor. While higher labor costs are compensated for by high labor productivity, many other costs undermine the ability of Massachusetts businesses to prosper with no offsetting benefits. The state ranks among the top ten nationwide in terms of the costs of workers' compensation, unemployment insurance, health insurance and energy.

High Cost of Living. The cost of living in Massachusetts has been consistently higher than the national average, particularly in the Boston metropolitan area. To some extent, this high cost of living is an inevitable by-product of higher than average wages. Costs — particularly real estate costs — are now moderating somewhat as a result of the post-1988 recession.

Localized Severe Economic Disadvantage. While Massachusetts as a whole enjoys wages and living standards which lie above the national average, significant parts of the state remain locked in economic distress. Many Massachusetts cities grew during the manufacturing boom of the 19th and early 20th centuries and have never found an adequate substitute for manufacturing jobs subsequently lost. Large urban populations suffer chronic joblessness, and racial minorities face the added burden of discrimination. Rural Massachusetts, while often picturesque, contains pockets of poverty comparable to Appalachia. From a human perspective, these conditions find expression in suffering, violence, and hopelessness. From an economic perspective they represent wasted potential and a major drag on the performance of the economy as a whole.

Regional Perspectives

Berkshire

- The Berkshire Region generally has lower costs than other urban northeast regions. House prices and wages lie well below the statewide averages, and industrial land prices are generally low.
- The region's large population of engineers and machine operators offer potential employers a mature and skilled workforce.
- Berkshire's physical beauty and extensive cultural resources make the region a pleasant place to work and a particularly attractive area to raise a family.
- Berkshire County's main infrastructure weakness is the poor north-south connection to the Massachusetts Turnpike and Route 2, leaving its largest communities without adequate interstate highway access.

Pioneer Valley

- The Pioneer Valley has an extraordinary range of educational institutions, including community colleges with strong training programs, several excellent liberal arts colleges, and the University of Massachusetts at Amherst with its highly regarded graduate research programs.
- The region is an attractive site for new business due to its lower industrial and office rental rates, and lower industrial land use costs than either Hartford or the Boston area.
- The region is favorably located, with Albany and Boston both only 90 miles away and Hartford only 20 miles away by interstate highways. It is easily accessible by road, rail and air.
- Unemployment and poverty are high in some urban and rural communities in the Pioneer Valley, particularly the cities of Holyoke and Springfield.
- Many small manufacturers in the region will continue to feel the impact of defense cutbacks in the industries and companies they serve as subcontractors.

Central

- The Central Region is one hour away from 6 million people living in and around Boston, Providence, Springfield and Hartford. This enormous market is made even more accessible by the region's excellent transportation systems.
- There is a growing biotechnology sector in the region, which is supported by local educational institutions as well as several technology transfer facilities and programs.

- The Central Region benefits from a large pool of skilled labor in such key industries as plastics, machinery and fabricated metals. The high concentration of firms within these industries, most involved in the production of specialty products, illustrates the diversity and depth of skills in the labor force.
- One challenge for the Central Region will be in establishing a unified, consistent development plan for the region that balances urban and "edge city" growth.
- The closing of Fort Devens in 1995 will mean the loss of over 6,400 jobs for the region in direct military personnel alone, with even greater losses when the impact to the local service economy is considered.

Northeast

- The Northeast Region's large concentration of computer and communications companies, while currently under stress, could offer significant future growth potential if companies remain innovative
- The Northeast is well-positioned with respect to business-university cooperation. Specifically, the University of Massachusetts at Lowell has positioned itself as a leader in issues involving industrial competitiveness.
- With its regional centers of Lawrence and Lowell located only 25 miles from Boston, the Northeast has the advantage of being close to one of the country's largest urban areas with its extensive array of markets and business resources.
- The cities of Lawrence and Lowell face difficult economic conditions, with high unemployment and poverty rates.
- The region's employment tends to be concentrated in relatively fewer employers and industries than some other regions. It has been adversely affected by declines in the defense and computer industries.

Greater Boston

- Greater Boston derives great benefits from its strategic location, diversified industry structure, incomparable research resources, and well educated workforce.
- Both new and established businesses in the area benefit from the City of Boston's status as a regional financial center. The presence of extensive financial resources has been instrumental in allowing entrepreneurs to turn their ideas into new companies in a variety of emerging fields.
- The region's large and diversified employment base is its greatest strength and the source of its future growth, and the extensive educational resources in the area provide career training for continuous upgrading of skills.
- While Greater Boston's resources at the college and university level are outstanding, the region suffers from wide variation in the quality of its public school systems.
- Several cities in the region including Chelsea, Lynn and some areas of Boston itself suffer from high poverty and unemployment rates.

Southeast

- The Southeast Region's extensive highway network provides excellent access to its major cities and industrial parks, and the region benefits from its proximity to the two major metropolitan areas of Providence and Boston.
- The region has a lower cost structure than the state as a whole in the form of lower average wages and lower land and construction costs.
- The region benefits from the presence of substantial education and research centers. The University of Massachusetts at Dartmouth is responsible for industry-specific education and research related to key regional industries such as marine science, textiles and electronics.
- The region is more dependent on traditional manufacturing than the state as a whole, and has fewer of the export-based knowledge services that provide high wage jobs.
- The cities of Fall River and New Bedford have experienced historic patterns of disinvestment resulting from the erosion of their base industries, and unemployment and poverty is high in these areas.

Cape and Islands

- The Cape and Islands' tourism and retirement economy has prospered largely because of the region's favorable location: though it feels remote, the region lies within close proximity to major population centers.
- The region benefits from its physical beauty and abundance of natural resources.
- The high quality of life that the region offers and its pool of educated labor could support future growth in innovation-driven emerging industries such as environmental services, marine sciences and software design. Marine sciences is supported by the presence of the Woods Hole Oceanographic Institution and the Massachusetts Maritime Academy.
- The Islands face substantial barriers to diversifying their economies, such as high costs, difficult transportation, and small labor pools.
- The economy of the region is in danger of being undermined by the deterioration of the local environment, and vice-versa.

Facing The Future

Understanding our strengths and weaknesses allows us to see beyond our current difficulties and clearly evaluate our future prospects. The institutions, skills, and businesses resident in the Commonwealth are among the best in the nation. Yet we must also address problems as diverse as retaining the highly skilled workers in our defense and minicomputer industries, building the basic skills of economically disadvantaged individuals, reducing bureaucracy in government, and improving the state's image with businesses and investors around the world. Knowing where we stand today helps us to define a vision of where we want to be in the future.

Chapter 4

Describing a Vision for the Massachusetts Economy

Rather than resist economic restructuring or attempt to ride out the storm, Massachusetts should strive to be out front in embracing the productivity and global trade revolutions.

Rather than resist economic restructuring or attempt to ride out the storm, Massachusetts should strive to be out front in embracing the productivity and global trade revolutions sweeping the national and world economies. Only in this way can we control our own destiny and secure a high standard of living and high quality of life.

Massachusetts should choose to compete by making the investments in people and technology that will make it a leader in productivity. This will impose sometimes difficult changes. In order to counteract the employment effects of rising productivity, Massachusetts firms must expand by opening new markets both at home and abroad, achieving rapid product cycles, and developing innovative new technologies, processes and products. The creation of new enterprises must be encouraged. Care must be taken to see that the benefits of long-term economic growth extend to every region of the state, and particularly to economically distressed urban and rural areas.

Making the choice to compete is just the first step. In order to determine the appropriate economic responses for the next decade, we must define an explicit vision of the economy we want to promote and the means that will get us there. This vision should provide the starting point for a compelling agenda for action that builds on our unique strengths, helps us to overcome our weaknesses, and motivates the public and private sectors to take joint action.

This *Strategy* describes a vision for the Massachusetts economy in five elements:

- A high standard of living.
- Job growth.
- Strong regional economies within the state.
- Broad economic opportunity.
- A good quality of life.

THE FIRST VISION ELEMENT: A HIGH STANDARD OF LIVING

A high standard of living can be defined as high per capita income relative to the regional cost of living. Massachusetts has traditionally offered not only higher wages but also a higher standard of living than most of the areas with which it competes. From a public policy perspective, economic growth aims to improve the quality of life and opportunities of the citizens of the state.

Historically, Massachusetts has lost hundreds of thousands of jobs to regions of the country and nations in the world offering a lower wage structure, and the global wage gaps facing Massachusetts businesses are often overwhelming. For Massachusetts workers to compete and, at the same time, earn a high and rising standard of living, Massachusetts companies must embrace the productivity revolution sweeping the world economy and move to its leading edge. At the level of individual firms, improving productivity is essential to remaining profitable while paying high wages. In a highly competitive economic environment this is a matter of firm survival as well. Constant productivity improvements at Massachusetts firms are, therefore, essential to both to a high living standard in the state and to the prevention of job losses due to business relocations or closures.

The Role of the State

As a strategic matter, the Commonwealth should seek ways to accelerate productivity improvement within the economy. This should occur at several levels. Most basic are actions designed to reduce the cost of doing business in the state. Other actions are those designed to increase investment and improve the capabilities of the workforce. Specifically, state actions that can contribute to productivity improvements are:

- Promote fiscal stability and maintain a reasonable and stable tax structure.
- Remove obstacles to new and expanding businesses by eliminating or modifying regulations that impose costs or delays on businesses without clear compensating

public purposes, and by streamlining and increasing predictability in the permit and approval process.

- Promote a better business cost climate by reducing the cost of business-related programs that are managed or heavily regulated by the state (including unemployment insurance, workers' compensation, health insurance, and energy costs).
- Improve public education at the preschool, primary, secondary, and college levels.
- Develop the workforce through skills training.
- Promote advanced know-how relating to management approaches and manufacturing methods, particularly in small- and medium-sized manufacturing firms.
- Promote private investment through measures to encourage the availability of equity capital and credit.
- Improve the infrastructure base in the areas of transportation, telecommunications, and utilities, with priority given to projects that can do the most to improve the long-term competitive prospects of the economy.
- Provide more efficient mechanisms for technology transfer from state university and government laboratories, and promote innovation.

Performance Measures

There are many ways to measure the standard of living and the factors which contribute to it. The primary measure of the living standard is *personal income per capita,* and Massachusetts' overall progress can be measured by the *rate of change in personal income compared to change in the cost of living.* Personal income data should also be broken into its various elements to determine how much is being derived from wages and salaries as opposed to investments or transfer payments. *Aggregate and average wages by industry* can illustrate the contribution that individual sectors are making to growth or decline in our standard of living.

The level and growth of productivity can be measured as well, but data available from federal sources lags by several years. *Overall gross state product and gross product per worker should be compared over time and to national averages,* but the Commonwealth should explore means of making its own, more timely estimates of these measures. The following chapter provides performance measures for the various actions that the public and private sectors can take to improve productivity and promote a high standard of living.

To move the economy back to sustained high employment levels requires access by Massachusetts firms to new markets, the development of new or better products or services, and the creation of new companies.

THE SECOND VISION ELEMENT: JOB GROWTH

As of the writing of this *Strategy,* unemployment in the Commonwealth remains unacceptably high, and the prospects for substantial improvement remain cloudy. As the experience of the post-1988 recession has demonstrated, productivity is a two-edged sword. The achievement of greater productivity levels has allowed many companies to reduce their labor force without reducing output. During this recession, statewide gross product, as indicated by aggregate personal income, appears to have declined only slightly, while employment has dropped dramatically. A substantial number of our citizens remain unemployed or underemployed and the productivity revolution, by itself, offers little grounds for encouragement that these jobs will return when the recession is over.

To move the economy back to sustained high employment levels requires access by Massachusetts firms to new markets, the development of new or better products or services, and the creation of new companies. Many large, existing companies might be able to stabilize employment through a combination of productivity improvements, new product development and new market development. However, increased employment for the Commonwealth's citizens must be sought primarily in the creation of new companies around new products or services and in the growth of those small and medium-sized firms most capable of aggressive product or service innovation.

The Role of the State

The Commonwealth should encourage diversification of markets, products, and companies in the state economy. Diversification of the economic base is critical to increasing employment. Specifically, state actions which aim to increase employment in the private sector are:

- Remove barriers and disincentives to the creation and growth of new and small businesses by eliminating or modifying regulations that impose costs or delays on businesses without clear compensating public purposes, and by streamlining and increasing predictability in the permit and approval process.
- Promote private investment in new and expanding businesses.
- Promote new product development and product improvement through technology transfer from federal, state and private laboratories and research centers to private companies, and through fostering partnerships between businesses and research and educational institutions.
- Utilize trade missions and export promotion programs to encourage Massachusetts companies to develop new export markets.

Performance Measures

The Commonwealth measures employment growth in two ways: a survey of nonagricultural employers ("CES-790") and a Current Population Survey of households

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. The first gives detailed information on total employment by industry and by geographic areas of the state. The Current Population Survey is more timely, and is used to estimate the unemployment rate of the Commonwealth and its constituent parts. It also contains an estimate of the total population and of the total labor force, defined as those at work or looking for work. The two measures can differ substantially in their estimations of total employment, partly because the CES-790 data does not capture self-employment.

THE THIRD VISION ELEMENT: STRONG REGIONAL ECONOMIES WITHIN THE STATE

The Massachusetts economy is comprised of distinct regional economies. The Commonwealth must coordinate its actions with local and regional planners to develop strategies that make sense for the Commonwealth's diverse economy. While many observers — particularly those from out of state — identify the Massachusetts economy with the advanced, research-based economy of Cambridge and Route 128, the real economy is more complex. Traditional manufacturing, including metalworking, plastics and textiles, continues to play a critical role. Tourism, marine industries, forest products and agriculture; financial services, and health services are all critical to the economic well-being of one or more regions of the state. A thriving state economy is one that offers jobs and economic opportunity in all regions of the state across diverse businesses and industries.

This *Strategy* is premised on the belief that a single set of economic development policies and programs delivered uniformly out of Boston cannot adequately serve the varied needs of the state's regional economies. Economic development is largely a local phenomenon. While the Commonwealth can remove certain obstacles to development and provide assistance and incentives for development, in the end, the initiative for new growth occurs locally.

The Role of the State

The Commonwealth must be an effective economic development partner with local and regional interests throughout the state, providing the incentives and assistance to promote competitiveness. Accordingly, the state government should approach its economic development agenda with an understanding of the diverse nature of the state's regional economies. For example, it should explore land-use policies that encourage the development of appropriate industry for the regions' needs, compatible with the environment and in locations with appropriate infrastructure and adequate transportation.

Important first steps in achieving this goal were the regional economic conferences held throughout the state during the fall of 1992. These conferences provided the basis for the recommendations of this *Strategy,* which includes economic profiles of seven distinct regions of the Commonwealth. Specifically, state actions that can help to strengthen the regional economies are:

- Deliver economic development services that are responsive to regional needs on a one-stop shopping basis through a network of regional centers. Investment by quasi-public agencies should reach all regions of the state, adapting to the specific requirements of each region. In addition, access to permits and approvals can also be provided regionally, using the one-stop shopping model.
- Develop stronger planning and working relationships with local and regional bodies concerned with economic development, and encourage the development of local and regional strategies for improved economic competitiveness in concert with this *Strategy.*
- Develop infrastructure needed to meet local and regional economic growth and design infrastructure to encourage appropriate land uses, avoiding environmentally sensitive areas.
- Develop training programs that meet specialized regional industrial needs.

Performance Measures

The strength of regional economies can be measured in many ways, ranging from employment levels and *employment growth by industry to payroll and average annual wages by industry.* Data on *unemployment rates, per capita income, occupational distribution and change* are also available. Not all of the data is available for the same geographical areas. Some is available for counties, some for metropolitan statistical areas, and some for Department of Employment and Training service delivery areas. The regional profiles contained in Chapters 9 through 15 of this *Strategy* make use of these measures, as well as 1990 Census data.

THE FOURTH VISION ELEMENT: BROAD ECONOMIC OPPORTUNITY

Certain geographic areas of the Commonwealth require exceptional job creation measures. These areas stand out in two basic ways:

- First, they did not, in general, benefit from the economic growth of the boom years of the 1970s and 1980s. Because prosperity did not come to them then, there is no reason to believe that in the absence of exceptional measures a new recovery will reach them.
- Second, as of this writing, these areas are suffering what can only be described as depression conditions in a recession environment. Double-digit unemployment coupled with chronic nonparticipation in the labor force undermines entire neighborhoods and communities and limits the opportunities for a better life for those who reside in them.

Areas of severe economic distress in the Commonwealth are of three principal types: small towns and cities outside major metropolitan areas, mid-sized industrial cities, and some inner-city neighborhoods of Boston, Worcester and Springfield.

The first type of distressed area includes the small cities and surrounding communities located outside of the major metropolitan centers. The mills and factories that once

served as the principal source of employment in these areas are now closed or operating at a level far below that which originally attracted and supported the local population.

The second type of distressed area is the mid-sized industrial cities of the Commonwealth, which grew up around a group of factories and transportation facilities especially during the growth years of the late nineteenth century. In the absence of restructuring and a resurgence of traditional manufacturers or the emergence of competitive replacement businesses, cities such as Brockton, Chelsea, Fall River, Lawrence, Holyoke, and Lowell will continue to struggle with elevated unemployment levels and distressed economic conditions.

The third type of distressed area is the inner city neighborhoods within the cities of Boston, Worcester and Springfield that failed to benefit substantially from the economic resurgence that benefitted other parts of these cities during the 1970s and 1980s. These neighborhoods suffer from continued disinvestment and deterioration of their housing stock, as well as violence and troubled school systems.

Statistically, the state's poor economic performance is concentrated in these distressed areas. If employment and labor participation rates in these areas could be brought up to statewide averages, the economic performance of the state as a whole would improve markedly. From an economic perspective, distressed areas represent severely underutilized human capital and physical assets, whose productive employment would benefit the state as a whole. From a human perspective, these areas represent wasted potential and communities desperately seeking economic hope.

A fundamental premise of this *Strategy* is that the best social program is a job. This is true from the perspective of individual independence and pride. It is also true from an economic perspective. The state government simply does not have the billions of available public dollars necessary to rebuild and maintain economically distressed areas of the state in the absence of productive employment for their residents. The resources necessary to rebuild and maintain these communities can only be generated from within, through the growth in each area of an indigenous working and tax-paying citizenry employed by competitive local firms.

From an economic perspective, distressed areas represent severely underutilized human capital and physical assets, whose productive employment would benefit the state as a whole. From a human perspective, these areas represent wasted potential and communities desperately seeking economic hope.

The Role of the State

The state government can use its powers and resources to guide private sector investment to distressed areas, overcome unnecessary obstacles to investment, nurture local companies, undertake workforce development, and help create the conditions necessary for enterprise development and job creation. Specifically, state actions that can strengthen distressed areas are:

- Target job creation incentives to economically distressed areas by providing incentives for private investment in these areas.
- Target technical and job training assistance to economically distressed areas of the state.
- Improve the infrastructure and physical assets of distressed areas through targeted state capital spending to encourage local business growth.
- Provide special assistance to minority-owned enterprises, including increased access to state procurement contracts and partnerships with established large employers.
- Improve basic education at the preschool, primary and secondary levels.

Performance Measures

The most important measurements of improvement in distressed areas are *increased local employment and decreased local unemployment.* The Commonwealth measures these on a community level, but figures are not available for individual neighborhoods of large cities. Community data also exists for *employment by major industrial sectors* such as manufacturing trade and services. Other important measures include *year-to-year changes in a community's total annual payroll and average annual wage.* The Commonwealth also publishes statewide *unemployment rates by race and ethnic group.*

Most data showing the economic performance of a single community or neighborhood comes only in the decennial federal Census. These indicators of poverty, per capita income, educational attainment, and other measures of distress in 1990 are used in this *Strategy,* but they cannot be used to measure progress until after the 2000 Census.

THE FIFTH VISION ELEMENT: A GOOD QUALITY OF LIFE

Massachusetts' good quality of life represents a major competitive advantage. The Commonwealth benefits greatly from its historic landmarks, its hills and forests, beaches and rocky shores, and other natural resources, as well as its concentration of excellent universities and medical centers, its social and cultural institutions, and its diverse populations.

This *Strategy* is an economic development strategy and not a blueprint for all government activities and purposes. However, the non-economic elements of the Massachusetts quality of life are relevant to economic development for two reasons. First, these elements play an important role in Massachusetts' competition for highly skilled and highly mobile members of the workforce. The state enjoys a natural advantage in this area since many young people who attend the states' excellent colleges and universities will stay

Describing a Vision for the Massachusetts Economy

The Commonwealth should encourage the application of new technologies to control pollution or to prevent it from occurring in the first place. A new solvent made from citrus rinds is used to clean printed circuit boards in Raytheon's Andover plant, replacing a toxic solvent used in the past. *Photo courtesy of Raytheon.*

after they graduate, if the state offers an attractive quality of life. Second, these non-economic elements of a good quality of life represent legitimate competing claims for government concern and resources.

Economic competitiveness is relevant to the enhancement of non-economic elements of the quality of life because it is the overall prosperity of the state that underlies the ability of its citizens, acting through government and private organizations, to build cultural facilities, improve recreational areas, aggressively promote environmental protection, improve public safety, and expand educational opportunity.

A successful economic development strategy will seek "win-win" solutions that accommodate legitimate competing government concerns. An example is environmental requirements that both preserve the environment and also promote economic growth by encouraging pollution prevention planning and the growth of new environmental technologies. These "win-win" solutions stand in contrast to confrontations that delay action and deadlock interests.

The Role of the State

A description of the myriad ways in which the Commonwealth seeks to improve the quality of life for its citizens is beyond the scope of the *Strategy*. However, several action categories provide specific examples of means to minimize potential conflict between economic and non-economic goals. They are:

- Develop regulatory strategies that de-emphasize command and control approaches and emphasize strategic planning to preserve the environment and also encourage economic development.
- Promote technologies that improve competitiveness and reduce pollution and resource use simultaneously, such as energy conservation and toxic use reduction.
- Improve the infrastructure base in transportation, telecommunications and utilities, to improve the capacity of these systems to support economic growth while limiting the adverse effect on the environment.

Chapter 5 Categories for Action

The preceding chapter described a vision for the Massachusetts economy in five elements, combining the aspiration for a high standard of living with a concern for job growth, strong regional economies, economic opportunity in distressed areas, and a commitment to non-economic aspects of the quality of life.

This chapter describes specific actions for state government to promote and support the accomplishment of that vision. Those actions fall into 12 general categories, which provide an overall outline for the Commonwealth's economic growth policies:

1. *Reasonable and stable taxes* through fiscal stability.
2. *Reduced government-regulated business costs.*
3. *Responsive regulations* that minimize business costs and encourage innovation.
4. *Getting beyond traditional regulation* by promoting innovative "win-win" solutions that prevent pollution while increasing competitiveness.
5. *An improved infrastructure base* for long-term competitiveness.
6. *Basic education* at the primary, secondary, and university levels that is second to none.
7. *An improved workforce training system* that addresses the real skill needs of the economy's employers and workers.
8. *Industrial extension services* that make knowledge of manufacturing "best practices" available to small and medium-sized firms.
9. *Improved technology transfer* through innovative institutional structures linking businesses with universities and other research institutions.
10. *Available private credit and capital* for modernization and job creation.
11. *Expanded export sales.*
12. *Greater state, regional, and local cooperation* for economic development.

Massachusetts will never be able to offer the lowest total business costs among all its competitors. What it can offer is the greatest possible value for businesses contemplating growth or expansion. Most importantly, it can offer an environment that prizes, supports, and stimulates innovation.

These actions together are designed to promote a highly competitive business environment — the best in the nation for economic growth and new business creation. Massachusetts will never be able to offer the lowest total business costs among all its competitors (at least not as long as it also aspires to provide it citizens a high relative standard of living). What it can offer is the greatest possible value for businesses contemplating growth or expansion. Most importantly, it can offer an environment that prizes, supports, and stimulates innovation. The design of new products, the invention of new production techniques, the opening of new markets, and the creation of new companies are the keys to an economy that is not only efficient but expanding.

Implementing the recommendations set forth in this chapter will, of course, not assure the realization of the economic vision. As is discussed in Chapter 2, government acts as one of four "partners for competitiveness" — the other three being business, labor, and the academic and research community. All of these four partners must do their jobs well for progress to be made towards a globally competitive state economy offering broad opportunity and a good quality of life. However, state government's failure to commit itself to creating a more competitive environment for business would almost certainly assure that the vision for the economy is not realized.

Marketing Massachusetts

In order for the Commonwealth's economic development efforts to have full impact, the business community must be aware of them. It should therefore be a priority to provide the information for businesses to take advantage of the resources which the state has to offer, and make informed choices for the future. This is especially true in light of the significant strides made in the past two years to improve the business environment in Massachusetts — the return of fiscal stability, balancing of three consecutive budgets, targeted tax reductions, controlling of business costs such as workers' compensation, and an

improved business/government relationship in general. An aggressive marketing plan should draw attention to these achievements and thus help to restore confidence in the Commonwealth, retain and expand our base of existing businesses, and attract investment to Massachusetts from other states and abroad.

In Chapter 2 it was noted that the government's role in improving competitiveness is not to dictate private sector decisions, but to improve the business environment in which private sector decisions are made to encourage investment, growth, and job creation. The Commonwealth's accomplishments to date in improving the business environment and its future progress in implementing this *Strategy* will mean little unless private decision makers are aware of them.

A marketing program should be directed both to businesses already located in Massachusetts and to businesses and investors outside the state. It should emphasize Massachusetts' value as a state in which to grow, particularly for companies committed to innovation and new product development.

These considerations have informed the dedication of $1.4 million in FY 1993 by the Executive Office of Economic Affairs to a comprehensive marketing plan. The plan builds on the themes of this *Strategy* and on the specific recommendations of the Task Force on Promoting Massachusetts of the Governor's Council on Economic Growth and Technology.

ACTION CATEGORY ONE: FISCAL STABILITY

AT ISSUE: THE NEED FOR STABILITY

Fiscal stability in government is the necessary foundation for economic growth. The Commonwealth must continue to maintain a balanced budget without recourse to new taxes. Fiscal stability provides the foundation necessary to carry out all of the action categories that follow.

Maintenance of fiscal stability is the Commonwealth's primary responsibility to the economy. Lack of stability can stifle private and public investment in the future. Instability in state government finances has a powerful and paralyzing effect on employers, who are forced to consider the impact of future tax increases when Beacon Hill appears unable to balance its budget.

Maintenance of fiscal stability is the Commonwealth's primary responsibility to the economy. Lack of stability can stifle private and public investment in the future.

Business profits and losses are made at the margin. What may seem like a modest change in business or personal taxation can have a major effect on where a company builds a new plant, how much it invests in research, and how many workers it hires. A two or three percent change in revenues or expenses can have a devastating effect on the many businesses with slim profit margins and debts to pay.

WHAT STATE GOVERNMENT CAN DO

The past five years have shown that the fiscal climate is not at the mercy of economic forces, but is a function of how well the state is managed. Mismanagement of state government finances in the chaotic period from 1989 to 1991 led to fiscal instability, new burdens such as a sales tax on services, and the fear that a state government in disarray would have to impose a massive tax increase in the future. These were considered powerful brakes on investment in the Massachusetts economy.

When the Weld-Celluci Administration took office in January 1991, the Commonwealth faced an $850 million deficit for the remaining half of Fiscal Year 1991 and a $1.8 billion deficit projected for FY1992. Both of these gaps were closed through spending cuts and better management of resources. Since then, the Commonwealth has proved capable of maintaining balanced budgets in the face of recession without recourse to new taxes. In fact, the state's tax burden has been significantly reduced:

- The personal income tax, raised to 6.25 percent in 1990 to cover rising red ink in the state budget, fell back to 5.95 percent in 1991.
- A new sales tax on services was repealed upon the new Administration's reaching office. This sales tax, also created to fill a large deficit in the state budget, would have imposed a heavy burden on consumers, and a severe competitive disadvantage to the many Massachusetts companies that are exporting services in competition with rivals in other states.
- The Research and Development tax credit was created. Now the most generous R&D credit in the United States, this tax cut was designed to maintain Massachusetts' preeminence as a world center for innovation.
- The Commonwealth's estate tax will be phased out. This tax, one of the most burdensome in the nation, induced elderly residents to move themselves, and their investments, out of state.

The bipartisan efforts to balance three budgets and reduce taxes in the past two years have stabilized the State's finances and set the foundation for the Massachusetts economy to move forward again. The triple upgrade in Massachusetts' bond rating from Wall Street in August, 1992 was a recognition from the market that the Commonwealth was again on solid footing, spending money responsibly.

With fiscal stability restored, the State has achieved the necessary first condition for businesses and investors to once again put their money into making the economy grow. New jobs are created when a growing company decides to build a new plant, an entrepreneur starts a new company, or a venture capitalist invests in a promising young firm. Today, the new facility or new company can locate in Massachusetts with confidence that the Commonwealth's continuing commitment to fiscal stability precludes a sudden tax rise that will wipe out its return on investment.

With fiscal stability restored, the State has achieved the necessary first condition for businesses and investors to once again put their money into making the economy grow.

Without fiscal stability and the business confidence it engenders, the Commonwealth could not hope to achieve the goals it has set forth. It is this hard-won confidence that allows the Commonwealth to now move forward in partnership with the private sector in the remaining areas for action outlined below.

PERFORMANCE MEASURES

There are several indicators of the state's fiscal stability that should be used to measure continued progress:

- ***A Balanced Budget.*** Most closely-watched is the Commonwealth's balance of *revenues versus expenditures.* Rapid change in components that make up the budget must be carefully monitored as well to detect potential future problems.
- ***A High Bond Rating.*** The Commonwealth's bond ratings measure Wall Street's confidence in its fiscal management, and determine the costs at which the state can borrow money for long-term investments. The state's ratings from the two agencies currently stand at "A", much higher than in recent years but still with room for improvement. *Further increases in the ratings* would lower borrowing costs still more, and instill additional confidence in the business and financial community that Massachusetts is a safe place to invest.
- ***A Budget that Stresses Investment.*** The balance in the state budget between investment items such as infrastructure and education, compared to consumption items, should also be considered a measure of fiscal stability. *An increasing ratio of investment to consumption items* is therefore desirable. Increased investment will bring a future revenue return flowing from higher productivity, higher incomes, and lower unemployment.

ACTION CATEGORY TWO: GOVERNMENT REGULATED BUSINESS COSTS

AT ISSUE: THE COSTS OF DOING BUSINESS IN MASSACHUSETTS

Few variables attract greater attention from an economic development perspective than the costs of doing business. Massachusetts is known as a state with high business costs, but this alone does not determine Massachusetts' competitive position relative to other states or nations. The state's high wages, for example, largely reflect the high value of employees' skills and knowledge and the level of investment Massachusetts firms have made in plant and equipment. Massachusetts must offer companies not the lowest business costs in the nation or world, but the greatest value as a business location, weighing both benefits and costs. That said, to the extent the cost of doing business can be reduced, the attractiveness of Massachusetts as a business location will be enhanced.

There are a number of high business costs in Massachusetts which do not necessarily reflect the value received in return, and thus constitute a disadvantage to locating here. Several of these costs are regulated or controlled by the state government, including unemployment insurance, workers' compensation, health insurance and energy. All four were at or near the highest levels in the nation in 1991, and their collective impact was higher than that of any other state. The three insurance costs have been growing much faster than wages, impeding employers' ability to raise salaries for existing workers and discouraging them from hiring new workers (See Figures 5A and 5B).

Some elements of these costs reflect special characteristics of the state, such as its distance from energy sources and the high quality of its health care. However, some of the high costs have been caused by fraud, lack of competition, or unusually generous benefits. Efforts to alleviate these costs over the past two years have succeeded in saving Massachusetts businesses hundreds of millions of dollars. More remains to be done.

WHAT STATE GOVERNMENT HAS DONE

Unemployment Insurance

Unemployment insurance (UI) costs are a large, but controllable, component of the overall cost of doing business in Massachusetts. The Commonwealth's unemployment insurance program is 100 percent employer-financed through payroll contributions; the benefit package and contribution rates are established by the Legislature through state law. At the time that the Weld-Cellucci Administration took office, total UI benefit payments had risen from $435 million in 1986 to nearly $1.1 billion in 1990, and were projected to top $1.2 billion in 1991. Employer contributions were escalating continuously and there was an immediate prospect of a deficit in the state's unemployment Trust Fund.

There are a number of high business costs in Massachusetts which do not necessarily reflect the value received in return, and thus constitute a disadvantage to locating here.

Over the past two years, the Weld-Cellucci Administration fought hard and successfully to rein in unemployment insurance costs. In July of 1992, a destabilizing and unnecessary doubling of contributions was rolled back. The policy discussion recently has been refocussed on the need for structural eligibility reforms. In 1992 the Administration secured the enactment of seven law changes which will collectively save some $45 million annually, and introduced a comprehensive package of cost-cutting eligibility and benefit reforms that would permanently reduce the program's outlays by 20 percent.

Workers' Compensation

Until recently, the benefit payout on an average temporary workers' compensation claim in Massachusetts was twice that of the national average. Between 1985 and 1991, the cost of the workers' compensation system in Massachusetts had more than tripled from $800 million to $2.5 billion. Two key factors contributing to this overwhelming increase in costs were the increase in the number of claims and the growing backlog of cases. The increase in claims was considered to be driven by rampant abuse and fraud

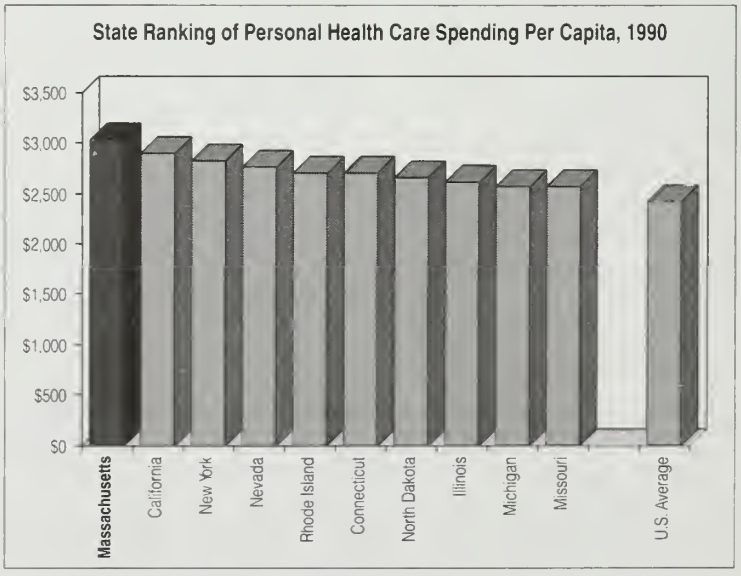


Figure 5A

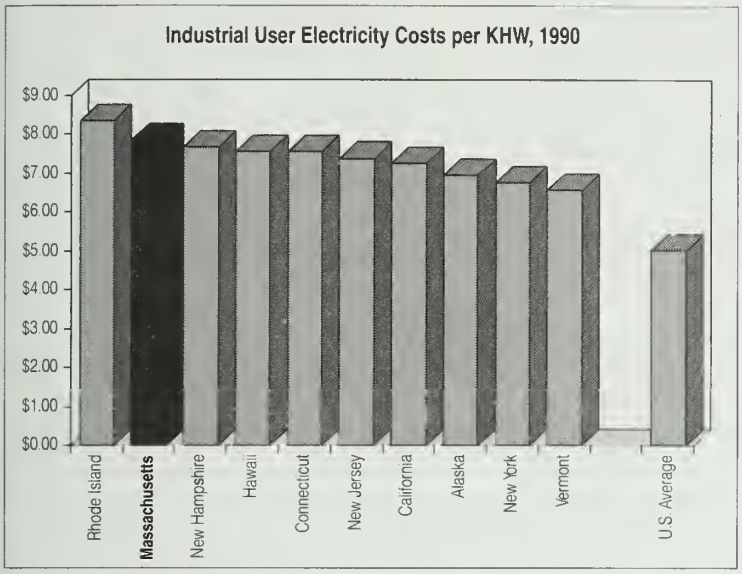


Figure 5B

throughout the system. The growing backlog of cases indicated that dramatic managerial restructuring of this system was necessary. Illustrating the system's crisis, the insurance industry put forward a request for a rate increase of 46 percent for 1992.

In response, a comprehensive legislative reform package which tightened benefits eligibility and targeted fraud was signed into law at the end of 1991. There was no increase in rates for 1992, and a modest 6.24 percent increase for 1993. The backlog of cases has been reduced from 9,000 cases to approximately 850 cases. The waiting period to appear before a judge has been reduced from an average of 9 to 14 months to 90 days.

By allowing employers to focus more on individual responsibility for workplace safety instead of requiring them to compensate for the losses incurred by less responsible companies, the workers' compensation system is beginning a return to stability.

Health Insurance

Health insurance is expensive because health care is expensive. Massachusetts is generally regarded as having the best health care in the nation for those with insurance. The state also has the highest per capita health care spending in the country, about 20 percent above the national average.

The Commonwealth is working to manage health insurance costs while expanding the availability of insurance. Hospital payment reforms enacted last year will enhance health care marketplace competition and simplify the state's outmoded hospital payment system. Reducing the cost per patient will reduce the statewide cost of health insurance. Preliminary evidence indicates that these payment reforms are working; the rate of increase in health care costs is slowing in the Commonwealth.

In addition to overhauling the hospital financing system, the health care reform legislation also contained important insurance changes. Recent reform of the small business health insurance market will significantly improve the availability and affordability of health insurance for small business. The law guarantees that policies will be issued and renewed for businesses with fewer than 25 employees that seek health insurance. It eliminates experience rating and reduces variance among rates due to age and geographic location over time. The reforms allow Blue Cross and HMOs to compete effectively with commercial insurers for small group business, and they allow commercial insurers to enter into a voluntary reinsurance pool to reduce the premium variation across carriers.

With these reforms, small businesses no longer fear cancellation of their insurance when they have bad claims experience, and they can move between insurers at will, because all insurers must offer coverage to anyone requesting it. The lowered variance in health insurance rates for business will make insurance more affordable for businesses with older or higher risk employees. Taken together, these reforms move in the direction of empowering private markets, while minimizing government regulatory intervention.

Energy Costs

In Massachusetts, a long-standing competitive disadvantage has been our high energy prices and vulnerability. The state is located virtually at the "end of the pipeline" for oil and natural gas, pays high transportation costs for imported fuels, and is vulnerable to oil and gas disruptions triggered by sudden severe weather. The result is energy costs that are generally 15 percent higher than national averages. Further, oil represents 66 percent of Massachusetts primary energy consumption as opposed to only 42 percent for the U.S. as a whole. Oil represents 46 percent of the state's electric utility fuel demand, as compared with 5 percent nationwide. Thus, fluctuations in world oil prices have a significant impact on the state's economy.

There are regulatory and technological ways to lower energy costs and increase reliability. Substantial progress has been made in the past four years.

- The Commonwealth has supported the creation of economic development rates, which are designed to encourage businesses to expand their operations, move into the state, or to help businesses in financial distress. A recent example of an economic development rate is the provision of a 20 percent discount on the cost of natural gas for the first year with a progressive ratcheting down of the discount to 0 percent at the end of 5 years.
- The Department of Energy Resources' (DOER's) "Energy Advisor Service" assists industrial customers in making their businesses more energy efficient to lower costs.
- The merger of the Energy Facilities Siting Council into the Department of Public Utilities represents a significant step to help

cut regulatory red tape and costs for energy developers and ultimately ratepayers.

- DOER has worked with several electric utilities on the design, implementation and evaluation of energy conservation programs for all customer classes. These programs have helped many large commercial and industrial customers reduce their energy bills and become more competitive.
- Recent decisions by the Department of Public Utilities have highlighted the importance of internal cost control and managerial efficiency. These decisions have emphasized a link between efficiently managed utility companies and economic development. The more efficiently the utilities operate, the less their economic burden on ratepayers.

To address Massachusetts' energy challenges, DOER is preparing a comprehensive State Energy Plan. The objective of this plan is to complement this *Strategy* by developing recommendations to ensure that least cost, reliable energy is supplied in an environmentally sound manner, and to stimulate energy-related economic development opportunities. Like this *Strategy*, the State Energy Plan will represent a major policy statement of the Weld-Cellucci Administration designed to improve the state's economic performance. The Plan is expected to be released in the Spring of 1993.

WHAT STATE GOVERNMENT CAN DO

Reforming the Unemployment Insurance Program

Massachusetts UI rates are still extremely high, in part, because the benefits are the most generous in the nation. The Special Legislative Commission on Unemployment Insurance should craft a comprehensive benefit reform proposal that brings Massachusetts more into line with our competitors. This commission, whose members represent key business groups, important labor organizations, and both branches of the Legislature, was created by state law in 1992 to review the overall UI benefit package in Massachusetts. A combined effort by the Administration, Legislature, business and labor can reach agreement on real and lasting reform to the UI program.

The Weld-Cellucci Administration will seek prompt legislative action on the Commission's recommendations in 1993. Further delays in moving forward with structural corrections to the UI program's cost imbalances will only retard Massachusetts' economic recovery. Thus, prompt enactment of a fair and balanced set of eligibility reforms is an urgent priority for the coming year.

Implementing the Workers' Compensation System Reforms

The strength of the anti-fraud and abuse components of the new law described above, and the aggressiveness with which the state's justice system pursues those who abuse workers' compensation, will help bring the costs of this system under control. The newly established Insurance Fraud Bureau will continue to investigate questionable acts by attorneys, doctors, claimants, employers, insurance companies and any other participants in the workers' compensation system. In addition, the Attorney General's office now has a separate division to handle workers' compensation claims.

Major administrative reforms, such as newly improved access to computer databases, both within state government and within insurance companies, will enable the Department of Industrial Accidents to monitor potential fraud and abuse by the individuals and employers who drain the workers' compensation system.

Reforming the Health Insurance Market

Developing strategies to lower the cost of health care will remain a priority for the Weld-Cellucci Administration, as it will for the private sector. One step toward lowering costs for employers would be to reduce the pressure on the uncompensated care pool, which reimburses hospitals for the cost of providing free care to uninsured individuals. The pool is funded by a "surcharge" or a hidden tax on the hospital bills of all private insurers, a cost ultimately borne by employers already providing health insurance for their employees.

In order to try to lower the number of people covered by the uncompensated care pool, the Weld-Cellucci Administration has been working to develop ways to make health insurance more affordable for the elderly and for nongroup members. Premium rates for both of these types of insurance have increased rapidly in the past few years, and as a result, many people have been forced to reduce their benefits or to drop coverage altogether. Reforming the markets for these types of insurance will reduce some of the pressure on the uncompensated care pool. Currently, the Administration is pursuing two initiatives to partially address the uncompensated care problem:

- *Nongroup Insurance.* In February 1993, the Administration announced a legislative reform package designed to contain the spiraling cost of nongroup insurance. Under the proposal, the Division of Medical Assistance would offer a moderately priced, state-sponsored health insurance plan for lower-to-middle income individuals who are unable to afford adequate health insurance coverage through a private carrier. The state-sponsored plan would largely replace Blue Cross/Blue Shield as the "insurer of last resort" for this line of insurance. Many of these individuals are self-employed or work for small companies, so the reform should be of great benefit to small businesses in Massachusetts.
- *Medigap Insurance.* In early 1993, the Administration unveiled a legislative reform package aimed at making medigap (Medicare supplemental) coverage more accessible and affordable for low income elders. This legislation, if passed, would

require any insurer who wishes to sell medigap insurance policies after April 1, 1993 to have annual open enrollment periods in February and March of each year. Other elements in the package would make medigap products subject to community rating and prohibit medical underwriting (no person could be denied coverage because of age, health status, claims experience, receipt of health care, or medical condition).

Lowering Energy Costs

While it is unlikely that Massachusetts energy costs will soon be among the nation's lowest, the strategy to mitigate those costs as much as possible includes continuing the current initiatives described above and adding new ones as follows:

- Setting a goal of making Massachusetts the most energy-efficient state in the country.
- Continuing to advocate for those utility rates which provide a wider range of services for businesses, including economic development and gas transportation rates.
- Insuring a "least cost" approach to utility resource acquisition by promoting competition and actively utilizing the marketplace for new resources.
- Working to ensure that energy efficiency measures at new or expanding businesses are eligible to provide Emission Reduction Credits in the federal Clean Air Act Amendments.

These initiatives will be further elaborated in the State Energy Plan, described above.

PERFORMANCE MEASURES

Unemployment Insurance. Massachusetts has by far the highest maximum potential unemployment insurance benefit with dependency allowance of any state: $12,690 in 1991. This is more than twice the national average and more than 45 percent higher than the next highest state, Rhode Island. Reform of the system is needed to bring Massachusetts more in line with our main competitor states. *Massachusetts' rate should be measured against a benchmark composite averaging the rates of our major industrial competitors. In 1991, this benchmark rate of 10 selected states was $6,570, less than half of the Massachusetts benefit.*

Workers' Compensation. Despite recent reforms, Massachusetts' workers' compensation costs remain high relative to the national average. *In 1989, the weighted average cost per $100 of manufacturing payroll was 49 percent higher than the national average, and Massachusetts had the seventh highest cost of all states.* In the following two years the Massachusetts rates increased a further 40 percent, but the State has held the line and minimized further increases following a 1991 reform. The State should continue to monitor the cost compared to the nation and our main competitor states to see if further reform is necessary.

Health Care. Between 1980 and 1990, both Massachusetts and national personal health care spending per capita grew at a compound annual rate of approximately 9 percent, reflecting spiralling health care costs. However, *the Commonwealth's spending per capita in 1990 of $3,031 was 20 percent higher than the national average of $2,425.* The concentration of advanced medical technology and well-known medical specialists located in the state will make it difficult to reduce the ratio of per capita spending to the national average, but reducing the gap would have an immediate, beneficial effect on state competitiveness. If the federal government acts on its promises of health care reform, it may also be possible to reduce the rate of national growth below the anticipated compound annual rate of 8.6 percent.

Energy Costs. New England has long had among the highest energy costs in the nation. Massachusetts cannot hope to drive costs down to the national average, but it *should keep costs competitive with surrounding Northeast states faced with similar structural disadvantages.* A composite rate of six surrounding states was six percent lower than the Massachusetts rate in 1990.

ACTION CATEGORY THREE: RESPONSIVE REGULATIONS

AT ISSUE: THE REGULATORY MORASS

Government has a responsibility to protect and enhance the public health, safety, and welfare and to preserve the quality of the natural environment. Regulation is among the principal tools for accomplishing these objectives. Massachusetts has historically shown a strong commitment to health, safety, and environmental regulation that has contributed to the quality of life enjoyed by its citizens.

However, the regulatory process is far from perfect. Regulatory measures are adopted that effectively duplicate the purposes of existing state or federal regulatory requirements, but which require their own set of forms and compliance procedures. Regulations grow by accretion rather than grand design. Obsolete requirements are not easily eliminated, because doing so makes agencies vulnerable to attack as lessening their protection of the public welfare. Impact on economic competitiveness is not necessarily a key issue considered by staffs in developing new regulatory requirements. Regulations are often adopted assuming staffing levels that are never funded. The result is bottlenecks as permit applications stack up on the desks of overworked officials, while the plans of companies get put on hold.

The resulting aggregate of regulatory requirements imposes a substantial burden on businesses. This burden includes procedural costs associated with compliance, the potential slowing of time to market for new products because of regulatory delays, and impediments to the ability of businesses to expand or develop new facilities as necessary to accommodate employment growth. Particularly hard hit are new and small businesses, which have the fewest surplus resources to devote to regulatory compliance.

The answer is not rolling back the level of protection afforded the public and the environment. The answer is recognizing that if the same level of protection could be provided with less cost and burden to businesses, particularly small businesses, the Commonwealth's competitive position would improve substantially.

WHAT STATE GOVERNMENT HAS DONE

To help create a more competitive economy, the Commonwealth has pursued, and must continue to pursue, regulatory reform and permit streamlining. "Regulatory reform" refers to the elimination or modification of duplicative, obsolete, or overreaching regulations that impose a substantial burden on business without a justifying public benefit. "Permit streamlining" refers to procedural reforms designed not to alter substantive standards but to make compliance easier, by offering a simple, coordinated, and expeditious process for obtaining multiple permits and approvals. Permit streamlining is relevant, in particular, to the process of approving complex development projects under applicable environmental regulations.

To help create a more competitive economy, the Commonwealth has pursued, and must continue to pursue, regulatory reform and permit streamlining.

Eliminating and Changing Existing Regulations

In November 1991, the Weld-Cellucci Administration announced Phase I of its Regulatory Reform initiative, which consisted of 131 administrative, regulatory and statutory reforms throughout state government intended to reduce red tape and facilitate economic development. Nearly half of those proposals solely requiring administrative action have been implemented, with the remainder still being implemented. Phase I regulatory reforms requiring legislative action have been far more difficult to achieve. However, two substantial legislative reforms have been adopted — reform of Chapter 21E (state "superfund") and the consolidation of the Energy Facilities Siting Council into the Department of Public Utilities.

Phase I of Regulatory Reform covered a broad spectrum of substantive areas, including banking, environment, state procurement, professional licensing, utilities, taxation, education, elder care, labor, trucking, blue laws, and many others. Although reform in each of these areas would offer clear benefits to economic activity in the Commonwealth, in the interest of brevity two representative areas are examined in this section. These two, environmental regulation and banking regulation, have particular bearing on the state's economic competitiveness.

Environmental Regulation

Massachusetts has demonstrated an unwavering commitment to environmental protection. This success is evident in the wetlands that were preserved throughout the development boom of the 1980s, remediation of hazardous waste sites, and historically polluted rivers that now run clean. However, Massachusetts environmental regulation is also one of the issues most frequently cited by business leaders in explaining Massachusetts' reputation as a difficult place to do business. The Weld-Cellucci Administration has responded to this problem by pursuing both regulatory reform and permit streamlining through the environmental agencies. Highlights of the efforts to date include:

Hazardous Waste Cleanup. In July 1992, the legislature amended the state "superfund" statute, Chapter 21E. Key changes include authorizing the licensing of private professionals to oversee the cleanup process, new private cost recovery procedures, and limited protection from liability for lenders and fiduciaries. Proposed regulations will establish clear reporting thresholds. Required cleanup

levels will take into consideration the future use of the property. Economic feasibility will be considered in selecting remediation measures and the proposed regulations will provide a clear end point in the site remediation process. Overall, these amendments will ease the present burden on staff of the Department of Environmental Protection (DEP) and expedite the cleanup process for those sites requiring remediation.

Wetlands. The Department of Environmental Protection (DEP) recently consolidated its two wetlands programs — the Section 401 Water Quality Certification issued under the Federal Clean Water Act, and Orders of Conditions issued under the State Wetlands Protection Act. As of October 1, 1992, the 401 certification was moved to the DEP Regional Offices. Accordingly, the wetlands staff in the DEP Regional Offices now simultaneously review applications for both program permits. The revised 401 certification procedures also established new program thresholds, below which projects are presumed acceptable under Section 401 of the Clean Water Act without formal review.

DEP Permit Process. In 1990 the DEP revised its permit process to increase the efficiency and to reduce the time involved in permit determinations. Under the new regulations a timeline is tailored to each permit program. A "money-back guarantee" has been implemented. If DEP fails to make a final determination within the allotted time, DEP must refund the applicant's permit fee in full. While fee dollars may or may not be a large factor for an applicant business, they are a strong motivating factor for regulatory staffs which are, in part, supported through licensing fees. These new regulations are helping to establish reliable permitting timelines. However, proponents of projects requiring multiple permits still face duplicative application requirements and different timelines for each permit program.

Procedural Changes. DEP recently instituted procedural changes shifting responsibility for several permitting programs to the Regional Offices. DEP also established an information hotline providing general information on DEP programs and permit requirements, and established Regional Service Centers to provide technical assistance to permit applicants. This focus on the Regional Offices is a step in the right direction, bringing many programs under one roof, to be easily accessible to businesses seeking permits.

Regulatory Reform. Out of 131 separate initiatives included in Phase I of regulatory reform, 16 concerned environmental regulations. Of those proposals, 15 have been implemented, including the significant legislative reforms described above.

Massachusetts has demonstrated an unwavering commitment to environmental protection. But the state's environmental regulation is also one of the issues most frequently cited by business leaders in explaining Massachusetts' reputation as a difficult place to do business.

The State Bank Regulatory System

The Massachusetts banking industry is beginning to emerge from its most serious financial crisis since the Great Depression. Although newly tightened lending standards, including both internal bank standards and those imposed by regulators, have hurt non-banking sectors of the economy, there is no question that change was necessary relative to the practices of some lenders during the boom years of the 1980s. Still, non-banking business leaders are asking whether the system has overreacted and imposed rigid credit standards that are no more warranted by current economic and business realities than were the free-wheeling practices of some lenders a few years ago. For their part, banking leaders blame anemic loan demand for reduced loan volume.

The Division of Banks, as the primary regulator of the state-chartered banking system, is keenly aware of the impact of regulatory and examination policies on the availability of credit. Consequently it has and will continue to take appropriate steps to ensure that its examiners fairly evaluate bank asset quality under generally accepted financial examination standards. It is hoped that these policies will encourage banks to lend to creditworthy borrowers without fear of adverse examination consequences.

Regulatory reforms are possible that do not alter lending standards, but which nevertheless reduce costs to banks and free resources for lending. The Division of Banks has undertaken a comprehensive review of the state bank regulatory system. One recent reform enabled banks to conform to the state Truth in Savings statute simply by conforming to the new federal requirements eliminating burdensome, duplicative reporting requirements. Another reform simplified the process by which undercapitalized state-chartered banks can convert to a stock company and simultaneously raise needed capital. Termination of the Home Mortgage Data Act reporting exemption enabled state-chartered banks to report directly to the Federal Reserve Bank of Boston, rather than through the Division.

WHAT STATE GOVERNMENT CAN DO

Continuing the Regulatory Reform Process

Regulatory Activity. Phase II of Regulatory Reform will focus on the biotechnology, telecommunications and environmental technology industries. Phase II will also include recommendations from state agencies, including several from the Department of Environmental Protection and the Division of Energy Resources. At the same time, efforts to implement the reform proposals of Phase I should continue. In particular, more aggressive action by the Legislature is needed to implement measures requiring statutory changes.

Categories for Action

Streamlining Environmental Regulations and Permitting

Chapter 21D. Although safe and environmentally secure hazardous waste disposal sites are critical to business operations, no new facility has been sited in the Commonwealth under the twelve-year old statute. Proposed, soon-to-be-filed changes are designed to foster greater cooperation between industry and site communities and to streamline the licensing process.

Clean Air Act. The 1990 amendments to the federal Clean Air Act require states with more serious air quality problems, including Massachusetts, to impose more stringent requirements. To ease the burden, the Commonwealth is proposing an emissions banking and trading system and other economic incentives which will allow market pricing mechanisms to minimize the cost of compliance for businesses.

Further Streamlining the Permitting Process. The next step toward streamlined permitting is to establish "one-stop shopping" by consolidating the application and review process for the various permit programs. In many respects, a framework for one-stop shopping is developing at the DEP Regional Offices where there is increased coordination between the individual permit programs.

There are two models of streamlined permitting to consider. One model is currently in effect on Cape Cod. MEPA and the Cape Cod Commission have signed a Memorandum of Understanding to undertake joint reviews involving local, regional and state permitting authorities. Under this model, MEPA review is conducted within the context of a common scoping hearing involving local, regional and state interests. When the MEPA review is complete, each permitting authority has sufficient information to issue a final decision on the permit.

A second model available as an option would institute a comprehensive permitting procedure. A comprehensive permit is a single, multimedia permit covering all state approvals which would be issued only after the review and approval of each permitting entity. The key advantage of a comprehensive permit is a streamlined process with a single application and a single timetable for all permit decisions. This would eliminate redundant application requirements and minimize the overall timetable for permitting decisions. Objectives for permit streamlining are set forth in greater detail in Chapter 6.

Continuing the Reform of the State's Bank Regulatory System

The Division of Banks will continue its comprehensive review of the state bank regulatory system. The Division's goals include:

- Continuing to provide a regulatory counterbalance to federal bank regulators by providing a local perspective on regional economic conditions and credit needs.

The next step toward streamlined permitting is to establish "one-stop shopping" by consolidating the application and review process for the various permit programs.

- Elimination of ineffective, duplicative and out-of-date state laws and regulations that unreasonably constrain banks and their ability to lend.
- Revising or modifying bank examination and training policies that inhibit the willingness of banks to lend to small or emerging businesses wherever possible, without jeopardizing the financial safety and soundness of banks or the banking system.
- Providing incentives to banks, under the Community Reinvestment Act, to aggressively lend to small and emerging businesses, particularly those in low- to moderate-income communities.

PERFORMANCE MEASURES

Regulatory Reform. Regulatory reform is generally a qualitative activity. Numbers of regulations eliminated or modified are not a reliable indicator of the depth or scope of regulatory reform. A single major initiative, like the reform of Chapter 21E, represents major progress in reconceiving an entire regulatory system with major positive implications for business growth.

Phase I of Regulatory Reform does provide numerical targets since a number of initiatives remain to be implemented. In all, 30 of the 61 initiatives requiring only administrative action have been implemented. In contrast 66 of the 70 initiatives requiring legislative action remain to be adopted. An *increased implementation rate for Regulatory Reform, Phase I* provides a near-term quantitative target. The best indicator of regulatory reform progress may be an *opinion survey of businesses across all industry sectors* that asks whether improvement is occurring in the regulatory system from a business perspective. Complete satisfaction by a regulated community is not expected. However, such a survey could indicate positive (or negative) change in business' perception of the system's impact on the ability to operate and grow a business in the state.

Permit Streamlining. The objective of permit streamlining is to coordinate as many permits and approvals as possible into a single, well-managed process. Permit streamlining is relevant, in particular, to environmental permitting of complex development projects. Progress towards implementing permit streamlining can be measured by the *number of related permits and approvals coordinated into the streamlined process.*

Massachusetts also needs to ensure that the application review process involves enough time for adequate consideration but is quick enough to facilitate fast-track development as required by individual companies. DEP's money-back guarantee time commitment has been met in at least 95 percent of cases. Other permitting agencies should be measured according to the *percentage of permits issued within a targeted time period.*

The results of the business opinion survey, discussed above, also offer a way to measure progress in achieving the goals of permit streamlining.

ACTION CATEGORY FOUR: BEYOND TRADITIONAL REGULATION: THE ENVIRONMENT AND ECONOMIC GROWTH

AT ISSUE: ECONOMIC GROWTH AND ENVIRONMENTAL QUALITY

New strategies are needed to achieve important environmental goals without creating obstacles to economic growth. In the past, government and industry perceived an inevitable tradeoff between economic growth and environmental quality. In fact, the environmental regulations which typically used "command and control" prohibitions and limitations actually created many of these tradeoffs. Now it is becoming clear that progress towards improving the quality of life in the Commonwealth lies in part with creative solutions that simultaneously promote environmental and economic agendas.

New solutions are emerging that can enhance the economic competitive position of the state while preserving or improving environmental quality. New environmental regulatory programs have led companies to minimize their use of toxic materials, often resulting in improvements in production efficiency.

Regulatory requirements for the use, storage and disposal of hazardous materials also have led to the development of new, "green" technologies. An example is "clean" chemicals which replace ozone depleting chloro-fluorocarbons (CFCs) or volatile organic compound solvents. The regulatory requirements have also led to the development of new pollution control and treatment technologies. These new solutions can improve production efficiency and promote emerging technology, aiding in the creation of new jobs. These strategies highlight the importance of innovative thinking to Massachusetts' future.

WHAT STATE GOVERNMENT CAN DO

Pollution Prevention Planning

Industry has long viewed the high cost of environmental compliance as a barrier to business development. Plant expansion generally requires time-consuming permits and costly pollution control equipment. However, strategies that aim to reduce the use of toxic materials in industry can also result in significant economic benefits. Businesses can plan front-end reductions in toxic materials, reducing liability risks, lowering treatment and disposal costs and reducing permit and fee requirements.

- *Toxic Use Reduction.* The Executive Office of Environmental Affairs (EOEA) and the Department of Environmental Protection (DEP) have instituted programs to prevent pollution at the front-end of the manufacturing process. The Toxic Use Reduction Act (TURA) aims to reduce toxic waste produced in the workplace by educating companies about the environmental and economic benefits of toxic use reduction. In many cases, replacing toxic substances in production or minimizing their use *increases* productivity as well as provides environmental benefits. The EOEA's Office of Technical Assistance (OTA) also provides businesses with information and technical assistance on toxic use reduction. Another important state program is the Toxics Use Reduction Institute at the University of Massachusetts at Lowell which conducts research and educational programs on toxics use reduction. These programs should be expanded, creating a pollution prevention component in each and every environmental program implemented by the state.

New solutions are emerging that can enhance the economic competitive position of the state while preserving or improving environmental quality.

- *Green Technology.* The growth of environmental regulation encourages companies to minimize their use of hazardous materials. This has created a new market for "green industries" such as recycling and the manufacture of clean materials and equipment that can eliminate or minimize the use of hazardous materials. The State should promote these new businesses, providing access to state funding sources and linking these enterprises with potential private funding sources. The State should promote the new technologies through marketing and export programs described in greater detail in other sections of this document.

Energy Efficiency

A key factor in business competitiveness is rising energy costs. The Division of Energy Resources (DOER) is currently developing a new State Energy Plan which aims to ensure least cost, reliable energy supplied in an environmentally sound manner. DOER is working in two different directions to achieve these aims. One strategy is energy conservation, and the second is the development of new alternative fuel or energy savings technologies. The State should ensure that these programs are coordinated with the technical and financial assistance offered through the Massachusetts Energy Advisor Service and the state's utilities.

- *Energy Conservation.* During the past few years, DOER worked with several electric utilities on design, implementation and evaluation of energy conservation programs. These programs have helped large commercial and industrial customers reduce their energy bills and improve their competitiveness. These programs should be expanded to reach all commercial and industrial customers seeking to reduce energy costs. DOER needs to continue its educational and promotional efforts to ensure that industry is aware of potential conservation measures.

Categories for Action

- *New Technology.* The lack of an indigenous fossil fuel supply and an "end of the pipeline" location for natural gas supply have led Massachusetts to be highly dependent on oil. The State should establish programs to develop new technology and minimize our dependence on oil. One such program is proposed in the State Energy Plan. It is the creation of a Regional Energy Technology Development Center to stimulate private investment in new alternative fuel technologies and in technologies that would provide greater energy efficiency.

Permitting Innovative Technology

In the past, permit applicants have found it difficult to obtain required environmental permits and approvals from DEP for the use of new "green" technology and new technology designed to treat or control pollution. This is partly due to DEP staff shortages and partly due to regulations and procedures which are not designed to evaluate emerging technology. In response to these bottlenecks, the State should develop an Innovative Technology Program to provide mechanisms for review and approval of new technologies. Using the proposed revisions to the State's septic system regulations as a blueprint, this program can draw upon the expertise of DEP staff, technical consultants and local universities as part of a New Technology Review Board. The Innovative Technology Program could also work with the Executive Office of Economic Affairs to link start up enterprises with access to funding sources and assist with marketing efforts.

Targeted Environmental Compliance

The high cost of environmental compliance creates a disincentive to business development in the Commonwealth. Without compromising environmental quality, the regulatory system needs to recognize that not all sites and industrial processes are alike. Environmental regulation should be risk-based, recognizing that less stringent requirements are required for facilities that pose minimal environmental risk. In fact, DEP is already taking steps towards a targeted, risk-based regulatory process. For example, the proposed revisions to the Chapter 21E hazardous waste cleanup regulations provide one set of thresholds and cleanup standards for industrial areas, and another, more stringent set of requirements for residential areas and schools. DEP should move ahead to promulgate these proposed revisions to the Chapter 21E requirements. Adoption of similar targeted regulations in other environmental programs would reduce compliance costs and potentially speed up the cleanup process in locations where more stringent requirements are not warranted.

The regulatory system needs to recognize that not all sites and industrial processes are alike. Environmental regulation should be risk-based, recognizing that less stringent requirements are required for facilities that pose minimal environmental risk.

Targeting Locations for Development

The State should guide development to appropriate locations where infrastructure is already in place, where the environmental conditions are sufficiently stable to sustain further growth, and where energy efficient and environmentally sound transit service will be available.

- *Targeted Infrastructure Development* - Infrastructure, including power, water supply, sewers, and roads, sets the stage for future development. These infrastructure improvements are costly. Accordingly, sites with infrastructure already in place cost less to develop and have a competitive advantage in attracting new development. The infrastructure decision-making process should take greater regard of environmental matters. The promotion of economic development within environmentally appropriate areas will serve to reduce the cost of environmental compliance within the Commonwealth. The Executive Office of Transportation and Construction should work with the Executive Offices of Environmental and Economic Affairs and with local and regional authorities, to adopt guidelines which define appropriate economic growth locations while discouraging infrastructure improvements that would promote development in environmentally sensitive areas.
- *Outreach and Education* - Information is a critical component of any market based approach. In order to weigh the costs and benefits of a selected parcel of land, developers must determine the environmental conditions and potential permit requirements. The Geographical Information System (GIS) operated by the Executive Office of Environmental Affairs identifies and maps out the environmental conditions of parcels of land. This system should be expanded to include all wetlands, streams, hazardous waste disposal sites and all areas of environmental concern for each city and town in the state.

  With GIS on-line, a developer could quickly access the information to obtain a general overview of the extent of potential environmental concerns and potential permit and compliance procedures associated with a location. Although the system would not provide a definitive determination of environmental concerns, it would provide developers with general up-front information about prospective development sites, highlighting sites that should undergo further investigation prior to making any commitments to develop the land.

PERFORMANCE OBJECTIVES

New Environmental Technologies. The State should increase the *number of new*

environmental technologies approved for use in Massachusetts to solve environmental problems in innovative ways. Establishing and staffing an Innovative Technology Program at DEP, and drafting new regulations for innovative technology review and permit procedures, should help Massachusetts become a leader in developing and implementing new pollution remediation and "green" technologies.

Energy Efficiency. According to DOER, Massachusetts *oil consumption, as a percentage of total energy consumption,* far exceeds oil consumption nationwide. The state needs to demonstrate progress in reducing its dependence on oil. The State should expand existing energy conservation programs and develop proposed programs for new technology.

Comparative Data for Alternative Pollution Control Strategies. The Executive Office of Environmental Affairs should establish a centralized referral or filing center for environmental statistics, following the guidance of the U.S. Environmental Protection Agency. These statistics would provide additional benchmarks as well as an improved basis for performing cost/benefit analyses of alternative environmental improvement strategies. Statistics to be assembled by this center should include: (1) *the cost of obtaining permits and implementing pollution control programs and the level of pollution reductions achieved;* and, (2) *the amount and percent of pollution prevention achieved by Massachusetts companies in each environmental media,* including the reduction of hazardous waste and energy consumption.

ACTION CATEGORY FIVE: IMPROVING THE INFRASTRUCTURE BASE

AT ISSUE: INFRASTRUCTURE INVESTMENT FOR ECONOMIC GROWTH

Infrastructure investment is directly related to the ability of the economy to grow and increase its productivity. Research conducted by the Federal Reserve Bank of Boston and by others has indicated that states which invest more in infrastructure tend to have greater output, private investment and employment growth.

Each dollar of capital expenditure should achieve the greatest possible enhancement of the Commonwealth's competitive advantages and prospects for long-term permanent job growth. The Commonwealth's infrastructure policy should give priority to those projects with the greatest impact on productivity and permanent job growth.

Massachusetts benefits from a massive infrastructure base created over centuries. However, the state's strength — a history of infrastructure investment that can support a large, complex society and economy — is also its weakness. The infrastructure base is old, and in places deteriorating or inadequate for modern commerce. Decades of surrounding growth have made expansions or replacements of certain key facilities difficult.

WHAT STATE GOVERNMENT CAN DO

Making Every Investment Dollar Count

Despite the pressing demands of balancing a state budget in recessionary times, the Commonwealth is committed to making long-term investments in maintaining and improving its built environment. These investments are essential to improve the state's economic status, and, in turn, to improve the state's revenue base.

This investment must have the maximum possible economic impact, however. Each dollar of capital expenditure should achieve the greatest possible enhancement of the Commonwealth's competitive advantages and prospects for long-term permanent job growth. The Commonwealth's infrastructure policy should give priority to those projects with the greatest impact on productivity and permanent job growth.

Pursuing Major Projects with Direct Economic Impact

Transportation Projects

The Commonwealth is currently involved in several major transportation projects which will greatly strengthen its existing transportation network and support long-term economic development.

- The Central Artery/Third Harbor Tunnel Project will improve highway access through and within the city of Boston, and between Logan Airport and the rest of Massachusetts. The project will enhance the ability of Logan Airport to serve the region and enable Boston to continue to function well as the center of New England's economy. The Project will have a considerable impact on reducing transportation costs for the entire New England region. Associated benefits of the Project include a commitment to undertake significant transit system enhancements and transportation demand management actions.
- The Route 146 Worcester - Millbury Project will improve access to Worcester and the Blackstone Valley from the Massachusetts Turnpike, thereby stimu-

lating economic development in these areas. The Project will widen Route 146 from an existing two lane facility to four lanes from Interstate 290 to Millbury, and create a new interchange with the Massachusetts Turnpike.

- The Northeast Corridor Improvement Project will complete high speed electric rail service from Boston to New York, allowing rail travel between the two cities to be completed in as little as three hours. Federal funding for magnetic levitation research, much of which will be carried out in Massachusetts, offers the prospect for much quicker future rail travel to New York and other cities, perhaps via Springfield and Albany.
- The Logan Airport Modernization Program will greatly improve Logan's ability to accommodate increased passenger volume over the coming decade. The program, involving an estimated investment of over $1.5 billion, will include the upgrade of maintenance and emergency facilities, the reconstruction of terminals and hangars, and expanded parking.
- The Old Colony Restoration Project will expand commuter rail service to 40 South Shore and Southeast Massachusetts communities along three branches of the former Old Colony System. The South Shore currently lacks rail linkage to Boston.
- The proposed 23 mile extension of commuter rail service from Framingham to Worcester will connect Downtown Worcester and several Metro West communities with Downtown Boston. The Grafton commuter rail station proposed for this line would directly serve the Biotechnology Park proposed in connection with Tufts University's veterinary school.

"Knowledge Infrastructure"

The Commonwealth and its university system are pursuing and supporting the public and private development of "knowledge infrastructure" — research laboratories, technology transfer centers, incubator facilities, and information networks — throughout the state. Each of the proposals promises to strengthen existing competitive advantages among industries in their respective regions. The Commonwealth's involvement varies greatly between projects. Some require a transfer of state land, some a capital appropriation, and others supporting infrastructure. Examples include:

- A $10 million Coastal Zone Research Lab in New Bedford will focus on developing the Southeast Region's research and business strengths in the fields of coastal environmental quality, underwater communications, marine electronics and marine biotechnology. The Commonwealth also is exploring with the Woods Hole Oceanographic Institute a proposal to develop incubator facilities for marine sciences spin-off firms.

The Commonwealth and its university system are pursuing and supporting the public and private development of "knowledge infrastructure"—research laboratories, technology transfer centers, incubator facilities, and information networks — throughout the state.

- The state is evaluating the feasibility of creating an educational telecommunications network that would link its K-12 school system into NEARNET, the New England Academic and Research Network, providing up-to-date scientific information, improved access to reference materials, and access to instruction not provided locally.
- Vacant state-owned parcels adjacent to the Worcester Biotechnology Research Park and the proposed Grafton Biotechnology Park are in the process of being conveyed for the development of biotechnology-related research and development and manufacturing facilities. The Grafton site would also be served directly by the new Worcester commuter rail line. The Worcester site is adjacent to the University of Massachusetts Medical Center.
- The University of Massachusetts is examining other possibilities for development of research, incubator, technology transfer and other facilities at its five campuses. These include an engineering technology center at Lowell and an information technology center at Amherst. Action Category Seven, "Innovation," discusses this initiative in more detail.
- At Boston's South Station, the MBTA will be constructing a bus terminal with the capacity to support the private development of a biomedical research center associated with Tufts University.
- The Massachusetts Maritime Academy is developing an Oil Spill Training and Research Center to establish itself as a leader in maritime-related environmental remediation.
- Bridgewater State College is developing a $10 million Old Colony Center for Technological Applications to pursue research and training in applying new information technology to education.

Rail and Sea Transportation

Currently the potential for rail and sea transport in the Commonwealth is not being met due to a lack of rail head room between key transport nodes, and the lack of rail links between the port of Boston and major freight lines.

In July of 1992 the Weld-Cellucci Adminstration announced a new partnership with Canadian Pacific and Springfield Terminal/Boston & Maine to provide direct rail service to the port of Boston via a new intermodal facility at Fort Devens. The new service enables cargo to be transferred directly to and from Boston & Maine rail lines at Massport's Moran Terminal in Charlestown. Under the partnership, cargo would be transported by rail to a new intermodal facility at Fort Devens, which would be linked to

Canadian Pacific's major United States distribution center in Chicago.

The new rail service will allow companies to ship cargo from Boston to Chicago in two days, the industry standard. The port of Boston will now be more competitive with other East Coast ports, helping Massachusetts to take advantage of its superior proximity to Europe.

The Weld-Cellucci Administration is also currently calling for raising bridge clearances to allow for double stacking of freight cargo. Double-stacked trains sharply cut rail costs in terms of labor and time. The lack of direct access for double-stacked trains from Boston to the Midwest has placed Boston at a disadvantage relative to other East Coast ports. Clearance must be raised at over 35 bridges in order to allow double-stacked trains to travel from Boston to Chicago in 38 hours, giving serious competition to rail commerce from New York.

Massport has an extensive capital investment and improvement program at Conley Terminal (in South Boston) and the Moran Terminal (in Charlestown) to enhance the port's competitive position in expanding world markets. In addition, Massport is a local sponsor of the Boston Harbor Dredging Project, designed to deepen the major shipping channels to handle the world's largest cargo vessels.

Economic Development of State-Owned Land

Massachusetts must maintain an adequate supply of developable land in order to attract industry and allow for the expansion of existing industries. While most of this development will occur on privately-held land, the consolidation of major state human services facilities is resulting in the availability of ten major campuses that comprise some of the largest single developable sites in their regions. Comprising 3,000 acres and 6 million square feet of buildings, most of these properties can be reused to provide jobs and opportunity for their surrounding communities.

For example, the most significant economic development opportunity in urban Boston is the 200-acre parcel of land located at the former Boston State Hospital grounds. The Administration will join together with community groups, the City, elected officials and the Legislature to accelerate the timetable for maximizing the economic opportunities at this site.

Tourism and Cultural Facilities

- *Sports and Convention Complex.* The Commonwealth is exploring the potential for a new professional stadium and/or convention center that would allow the city to host large national conventions and trade shows, and major sporting events such as national basketball championships and the Olympics.

Rather than opening up new areas of the state for development by creating new infrastructure, existing cities and other centers of development will be strengthened with infrastructure improved to accommodate growth.

- *Worcester Centrum Expansion.* A recent feasibility study has determined that the Commonwealth should support the expansion of the Worcester Centrum to include a new convention facility.
- *Mass MOCA.* The proposed Massachusetts Museum of Contemporary Art in North Adams would be the largest such museum in the world. Its proponents have secured the permanent loan of one of the world's premier collections of contemporary art, but are still attempting to raise private matching funds necessary to secure the Commonwealth's commitment to the project.
- *Tourist Information Centers.* The state's tourist information network leaves much to be desired. Several main routes, such as the main approaches to Cape Cod, have few or no public information or rest room facilities. The Commonwealth should develop an inexpensive prototype information center that could be built with a mix of public and private sponsorship. The goal should be to have such centers at every major entrance route to the state in two or three years.

Maintaining Existing Resources

In addition to developing new projects, the Commonwealth is committed to providing the upkeep to its existing public capital base necessary to maintain and attract future economic activity. For example, the Massachusetts Highway Department allocates $400 million annually in state and federal funds towards the maintenance of roads and bridges.

Excepting the major new projects described above, most of the Commonwealth's future transportation spending will be focused on upgrading and maintaining existing resources. Rather than opening up new areas of the state for development by creating new infrastructure, existing cities and other centers of development will be strengthened with infrastructure improved to accommodate growth.

Investments will also be made in bus and rail transit to provide increased consumer choice and to meet the needs of new businesses for convenient and affordable employee commuting. This includes cost-effective additions to "Park and Ride" facilities at transit stops as well as improvements in service to existing and new locations.

The Application of High Technology to Existing Infrastructure

Given its extensive existing infrastructure base, the challenge for Massachusetts lies as much in obtaining maximum utility for its existing systems as it does in building new ones. New technology is now being developed to allow roadways to be used more efficiently, through automatic traffic direction, and by systems

that inform drivers of the most efficient routes to their destinations. If this means that existing systems can be used at greater efficiency rather than replaced, the savings for a state like Massachusetts could be in the billions of dollars. Other applications of high technology include electronic monitoring systems that can be used to assess infrastructure deterioration on an ongoing basis both to protect public safety and assure the most efficient allocation of maintenance funds.

Massachusetts has a vested interest in aggressively pursuing these high technology options. Not only would the Commonwealth save money from better use of infrastructure systems, but local companies could be at the cutting edge of developing these new technologies. Indeed, the Defense Technology Task Force of the Governor's Council on Economic Growth and Technology has identified advanced transportation technologies as a promising commercial market for defense companies seeking diversification or conversion opportunities.

Economic Development Capital Program

One means to assure that increasing statewide competitiveness is the primary objective of at least a portion of the State's capital budget would be to establish an ***Economic Development Capital Program.*** This program would commit up to $100 million per year for five years to projects with the greatest potential for creating permanent, long term economic growth and competitiveness. Priority should be given to projects which:

- Improve upon or create a competitive advantage for the state as a whole or in a given industry.
- Create high quality permanent jobs, either directly or indirectly, in addition to construction jobs.
- Leverage the maximum amount of private investment for each public dollar spent.
- Are consistent with and promote the objectives of this *Strategy.*

The *Economic Development Capital Program* would direct resources towards innovative infrastructure investments which strengthen the competitiveness of Massachusetts' industries. Accordingly, the program could be used to fund a diverse range of economic infrastructure projects, such as telecommunications networks, research laboratories and incubator facilities at public higher education institutions, and enhanced rail links.

A flexible ***Economic Development Grant Program*** should be included as part of the Capital Program to facilitate the rapid funding of smaller-scale, public infrastructure improvements with economic development potential that are proposed by municipalities. The types of projects benefiting from the program would include road extensions and expansions to accommodate new employment in industrial parks, and the extension of sewer lines to industrially zoned areas.

PERFORMANCE MEASURES

Because infrastructure projects are easily identifiable, benchmarks are less important than simply noting whether the Commonwealth has delivered on its development promises. There are, however, a few useful measures of broad performance.

Permanent Economic Impact. The Commonwealth should estimate *the number of permanent jobs resulting from investments in capital projects.* Benchmarks should be established pertaining to the percentage of capital investment that goes to projects with long term economic development potential.

A measurement of *the number of permanent jobs resulting from the transfer of state property to commercial uses* should be established. Establishing performance goals will provide an added incentive to convert currently inactive state property.

Overall Capital Sending Levels. One way to measure the Commonwealth's commitment to maintaining its public infrastructure is through measuring *real per capita outlay for public infrastructure and facilities.* The Commonwealth must maintain and improve this number in order to maintain the state's productivity and competitiveness.

Modern Telecommunications Infrastructure. The telecommunications infrastructure in Massachusetts is critical to economic growth and expansion. Telecommunications lines are no longer used solely for voice-to-voice communication: facsimiles and data are now transmitted over telephone lines. Two measures of performance in this area are *the percentage of Massachusetts businesses and households with single-party touch tone-capable telephone service, and the percentages of Massachusetts telephone lines that can reliably transmit data at high and medium speeds.*

Mass Transit Use. Increasing the use of mass transit is an important goal for Massachusetts. Particularly with the disruption to road traffic expected from the Central Artery construction project, increased capacity and use of the Greater Boston transit system is imperative to keep the economy flowing smoothly. The State should monitor both *carrying capacity and passenger miles per capita.* In 1990 we ranked third among all states, behind only New York and Hawaii, with a total of 299 passenger miles travelled per capita. Our rank should be maintained and the number of miles travelled should increase each year.

Substandard Roadways and Bridges. The Commonwealth's $400 million highway maintenance program should be making progress in the enormous task of remedying the substandard roads and bridges throughout the state. *In 1990, 56.9 percent of Massachusetts' bridges were rated either functionally obsolete or structurally deficient (though not necessarily unsafe) by the Federal Highway Administration, and nearly 3,000 miles of roadway were considered to be in "poor" condition.* Bringing each of these numbers down while focusing on the most dangerous deficiencies is an important goal.

ACTION CATEGORY SIX: IMPROVING BASIC EDUCATION

AT ISSUE: AN EDUCATION SYSTEM UNDER PRESSURE

State government must work with schools to create an education system that will provide what is necessary to prepare our citizens for the workplace of the future. Jobs not requiring at least high school verbal and mathematics skills are disappearing from the economy. Jobs once involving traditional trade skills now frequently require workers to use computer-controlled machines or digital instruments. Truly unskilled labor will represent a tiny fraction of all employment in the Commonwealth by the year 2000.

To assure that tomorrow's workforce is educated adequately, there must be significant changes in the educational system at all levels. Massachusetts cannot simply rely on a stream of elite students from its private colleges and universities to form the foundation of its economy. Massachusetts must educate all of its students well. Unfortunately, the public education system falls far short of this goal.

- Massachusetts ranked 47th of all states in the percentage of 1990 state and local government spending that went to elementary and secondary education.
- Massachusetts ranked 30th among states in the rate of public high school graduation in 1989 (see Figure 5C).
- Over 40 percent of the 4th, 8th, and 12th grade students taking the Massachusetts Educational Assessment Program (MEAP) test in 1992 did not understand the basic components of their grade's curriculum.

Establishing a consensus on how to improve these rankings must be among the Commonwealth's top priorities. Without consensus for change, students will not get the education, the training, and the guidance that they need to succeed as part of Massachusetts' future workforce. This consensus must reflect a common understanding about what is required to compete in the national and world economy; must develop clear standards for individual and group achievement; and must create workable strategies to help students master a complex world where science, technology and commerce are part of their daily lives.

Without consensus for change, students will not get the education, the training and the guidance that they need to succeed as part of Massachusetts' future workforce. This consensus must reflect a common understanding about what is required to compete in the national and world economy.

Part of this vision involves *prevention* — acting to head off potential problems. This is especially important with respect to giving all children access to early childhood education and the effective teaching of basic skills in elementary school. Both would forestall the need for expensive and difficult remedial intervention at a later date.

Another part of the vision involves *reform* — making the system work better. There have been many new ideas put forth at both the national level and at the state level which would accomplish this in areas such as teacher training, the creation and enforcement of academic standards, school choice, and new curriculum models.

Finally, the connection between learning and working must be made and reinforced. This will both create a sense of purpose for students, and strengthen Massachusetts' economic growth prospects. The long-term needs of learners who will work and workers who will keep learning must be addressed at all levels of education in order to invest in the economic health and growth of the Commonwealth. Towards this end, a partnership between schools, business and government is encouraged.

WHAT STATE GOVERNMENT CAN DO

Early Childhood Education

The Executive Office of Education has identified two goals that state government should pursue with respect to early childhood education: universal availability and coordination of services to children at risk. It is well known that Head Start and programs like it are successful in producing positive outcomes, but the federal Head Start program is not available to most of the children that need it. While it may eventually be fully funded, the state must develop and imple-

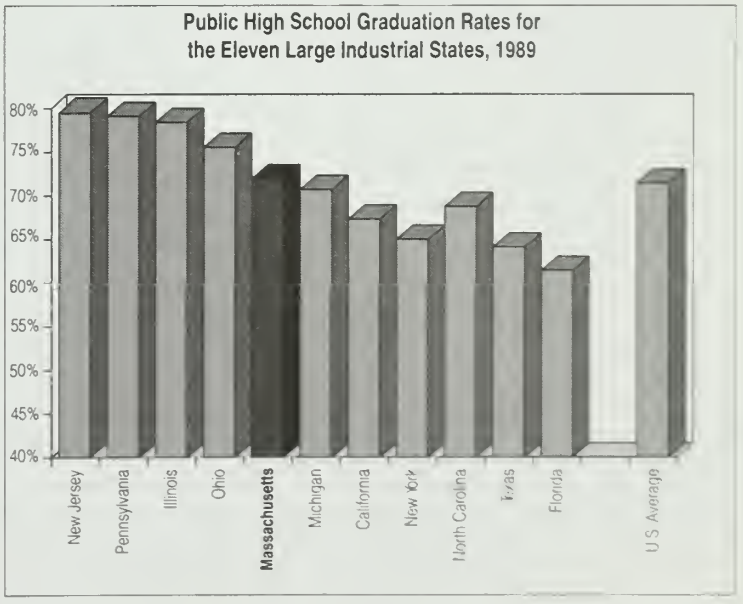


Figure 5C

Categories for Action

ment its own programs now. One proposal under examination is a family literacy program enrolling parents in school at the same time as their children to fill in the gaps in their own learning, and to learn how to teach their children.

Children who are at risk generally face problems that go far beyond education and cut across bureaucratic boundaries. To deal with this, the Executive Office of Education will convene working groups made up of all agencies responsible for regulating or providing services to children. These groups will make recommendations on how to coordinate efforts, such as using school settings as the location for delivery of other social services.

K-12 Public Education

Education experts see five basic challenges that Massachusetts' education system must overcome:

- Lack of a common core of learning, as well as a method of assessing what has been learned.
- Structures of governance that fail to permit sufficient local autonomy to schools to meet the needs of their students.
- Teacher preparation that is often out of step with the most recent knowledge of important subjects and effective teaching methods, and seniority systems that result in staff teaching subjects for which they have little training.
- Lack of required professional development of educators due to the tenure system.
- Wide variations in school funding from one community to the next with many communities not spending enough to provide quality education.

Education reform must address all of these issues. The development of tough, measurable standards for all students would involve developing a core curriculum and a new statewide assessment program. Teachers should be hired based on merit and dismissed if they fail to meet professional standards. This requires eliminating tenure and limiting the use of seniority in retention, promotion and assignments. Reform should require teachers to renew their certification every few years, but also improve the professional development system to help them meet the tougher requirements.

Vocational/Technical Education

Not everyone goes to college, and high-quality vocational education is crucial to the employment prospects of those who do not. Specific goals include improving existing occupational programs, translating industry standards and private sector job requirements into new programs, and adding work-based learning components — apprenticeships — to secondary school curricula.

Public higher education needs to be seen more than ever as a critical element of the state's economic infrastructure. The state's public institutions must take on the mission of preparing a broad cross-section of Massachusetts residents for a rapidly changing economy.

Tech prep education (also known as Two Plus Two) is one of the most significant innovations in the Commonwealth's education system. By formally linking secondary and post-secondary curricula, it provides the basis for major structural change in the educating process. Tech prep provides non college-bound students with an uninterrupted progression from high school through two years of post-secondary occupational education, culminating in a certificate or associate's degree. It prepares the student for direct entrance into a highly skilled technical career or for continuation of his/her studies towards an advanced degree. It is a new pathway for students that allows them to keep their options open.

The most extensive current program is the Merrimack Valley Occupational and Tech Prep Educators Collaborative, linking two community colleges (Middlesex and Northern Essex Community Colleges) and five vocational-technical schools in the Merrimack Valley. The consortium offers coordinated high school and college courses in business/office technology, computer technology, drafting, electronics, graphics/commercial art, health careers, industrial electronics, and machine technology.

The apprenticeship model of vocational education has a promising example in Boston's Project Protech, where students start working as hospital apprentice technicians in the last two years of high school, take courses designed around the scientific and math skills needed in the jobs, and continue to work while attending a community or technical college for further appropriate classroom training.

Public Higher Education

Massachusetts' preeminent private institutions account for much of its economic success, contributing scientific innovation and a talented elite of graduates to the state's technology- and knowledge-based manufacturing and services firms.

However, economic competitiveness increasingly requires a broader base of human capital and innovative technology than our private institutions can alone provide. Public higher education needs to be seen more than ever as a critical element of the state's economic infrastructure. The state's public institutions must take on the mission of preparing a broad cross-section of Massachusetts residents for a rapidly changing economy.

The consolidation of five campuses into a single University of Massachusetts creates a strong entity that can cover a broad geographic base and serve many of the state's critical needs. The University campuses and the state colleges have the ability to participate in a variety of ways in the state's economic development plans:

- Redesigning curricula to become more focused on the economic strengths of the school's region, and developing the flexi-

bility to respond quickly to changing needs such as emerging industries or displaced workers.

- Providing technical assistance to apply existing knowledge of effective management and production practices to small and medium-sized industrial firms.
- Conducting basic and applied research in collaboration with industry in areas of strategic importance to each region's industrial sectors.
- Transferring and commercializing the technology being developed in university laboratories to industry, especially to firms in the school's region.
- Supporting the development of new businesses in the state through programs of entrepreneurial support, incubators, and research parks.
- Promoting and supporting international trade through appropriate new curricula and the provision of technical assistance and marketing support to firms moving into new markets.
- Serving as an expert resource to public and private policy-makers through programs of economic analysis and research.

At all levels of the higher education system the Commonwealth will emphasize local governance of institutions to ensure that individual schools are given greater autonomy and flexibility over their operations than in the past. The action categories on Innovation and Know-How discuss the role of the public university system in more detail.

Educational Telecommunications

Massachusetts' leadership in developing information and communications technologies has just begun to be applied to education, where it can greatly assist in the delivery of programs and services. In the future, there could be a statewide electronic network that would connect educational institutions at all levels. The network would link their classrooms, libraries, laboratories, workshops and conference rooms via voice, data, graphics and images-based interactive communications. The use of interactive computers and telecommunications networks in schools can allow them to present instructional content that is live and comes from active information sources. Telecommunications technology can also help remote and poor school districts by opening up vast outside resources.

There are already several substantial educational network services operating in Massachusetts. The State should work to expend network integration, and to establish effective technology initiatives in schools. The Commonwealth is now weighing the feasibility of linking its K-12 school system to NEARNET, the New England portion of a national academic network that now links higher education institutions.

The Commonwealth is uniquely positioned to create cooperative efforts between schools, universities and the many companies that are developing advanced information systems for commercial and military applications. The Defense Technology Task Force of the Governor's Council on Economic Growth and Technology has identified educational technology as a promising commercial market for some defense contractors searching for diversification and conversion opportunities.

The State's education reform efforts also address the professional development and training needs of teachers who will implement a statewide technology policy. Bridgewater State College's Old Colony Center for Technological Applications will focus on research and training for the use of effective new technologies in education.

PERFORMANCE MEASURES

High School Graduation. This measure shows Massachusetts' ranking among states — 30th from the top — in the *percentage of students who graduate from high school.* Given our need for a highly educated population, this mediocre performance must be improved. The State needs to pinpoint where completion rates are low and work to identify the particular causes in order to formulate an effective response.

College Educated Population. This measure shows Massachusetts' rank among states — first — in *the proportion of the adult population with a college degree.* As a major foundation for the state's economic success, we must retain this ranking. In doing so, we cannot rely solely on an influx of college-educated people from other states, but must provide quality public higher education for our own population through the University of Massachusetts and the state college system.

Spending on K-12 Education. This measure shows *the dollar amount difference in state and local spending per enrolled student from a national benchmark* developed by Harvard Professor Herman Leonard that accounts for differences in costs and student population mix between states. In 1979, Massachusetts ranked first among states in its commitment to K-12 education, spending about $900 above the national benchmark. By 1989 we had fallen considerably in rank, and spent $200 less than the national benchmark. This trend must be reversed.

Massachusetts Educational Assessment Program (MEAP). MEAP testing measures *at-grade competency of students in the 4th, 8th, and 12th grades.* As administered in 1992, these tests showed that a substantial majority of students in Massachusetts either do not understand their curriculum or have a basic understanding of their curriculum but cannot go beyond that to reason and communicate clearly from underlying principles. The good news is that competency is rising. Although the tests have been criticized by some as too stringent, they do offer the basis for a benchmark for improving primary and secondary educational standards statewide.

The Development of National Educational Quality Standards. At present, the availability of data which would allow quality comparisons of primary and secondary education across states is very weak. *A standardized national testing system* which would allow for the establishment of elementary benchmarks is now under development. This effort should be strongly supported in Massachusetts.

ACTION CATEGORY SEVEN: WORKFORCE TRAINING

AT ISSUE: UPGRADING THE COMMONWEALTH'S BASE OF SKILLED LABOR

The rapid modernization and upgrading of Massachusetts' economy is changing the nature of everyday work. This change presents significant challenges to the Commonwealth's publicly funded education and job training systems. These systems must deliver not only better basic education for those entering the workforce, but effective training and retraining of existing workers that meets the particular requirements of businesses and industries.

Part of the demand stems from restructuring in the economy. Demand for certain job categories is decreasing, while that for other job categories is increasing. For example, the software industry reports an unmet need for programmers and software engineers in the face of a high statewide unemployment rate. Companies that are undergoing modernization also face training needs. The installation of new computer-controlled equipment, and the implementation of new management structures and quality-control procedures, places new demands on workers. Only the large existing public training system, working in partnership with private firms, can hope to meet the need.

The Massachusetts workforce development system is extensive, but is not yet living up to its potential. It consists of dozens of separate job training, employment-related education, and job placement programs that serve more than 10 percent of the Commonwealth's labor force each year. At least $365 million is spent annually, with the bulk of the funding coming through federal grants. Most of these programs operate separately from — but are closely related to — the state's K-12 and public higher education systems.

For the past two years, the Commonwealth has been taking a hard look at the effectiveness of the existing system under the leadership of Lt. Governor Cellucci and the MassJobs Council, which serves as the Governor's principal advisory board for workforce development policy. The Council has identified several important limitations to the current system:

- The system is not really a system at all; rather, it is a confusing collection of free-standing programs that operate largely in isolation from one another.
- The types of training offered are too often defined by program requirements established in Washington, and by the capabilities of existing service providers, rather than by the current needs of Massachusetts' industries.

The Massachusetts workforce development system is not fulfilling its potential and not meeting the needs of the economy.

- The programs usually have not been designed to serve the long-term needs of an economy in rapid transition, but rather to get people off the unemployment or welfare rolls as quickly as possible.
- Information about the range of services available and the relative effectiveness of different programs is limited or unavailable.
- Programs receive funding on the basis of numbers of people served, rather than on the basis of the effectiveness of the services offered. The skills required by a modern economy require substantial training periods, but the system rewards rapid turnover.
- Roughly two-thirds of the system's funding is from federal sources that restrict use of funds to the short term training needs of the economically disadvantaged. Federal funds are not available for the long term training needs of the currently employed.

WHAT STATE GOVERNMENT CAN DO

Building a Market-Based Workforce Development System

As it currently stands, the Massachusetts workforce development system is not fulfilling its potential and not meeting the needs of the economy. Through the efforts of the MassJobs Council, the Commonwealth must create a true workforce development system that is market-driven and directly serves the specific needs of the most important industries in each part of the state.

- The system should, wherever possible, emphasize a "demand" or customer driven perspective, not a "supply" or program driven perspective. The system should be driven by decisions made in the marketplace by the thousands of individuals and businesses in need of assistance from the state's various job training, placement and employment-related education programs.
- The system should be understandable to its customers (both employers and job seekers) and easy to use.
- The system should focus on outcomes or performance. All incentives to service providers must be contingent upon the achievement of performance thresholds. A Placement Accountability System can be implemented to track the employment and earnings impact of workforce development programs over time. The Commonwealth must distance itself from the practice of defining success by the number of units serviced.
- The system should be administered locally, but guided centrally. A strong state-level policy coordinating body is necessary to establish a single, consistent set of objectives to guide the system. Central

guidance is particularly important in setting overall goals for the job training system, and in defining and measuring the system's cost inputs and performance outputs. At the same time, because programs are delivered locally, it is at the local level that administrative coordination is most essential. This implies a local policy-setting body which is reflective of community and area business interests, and which can allocate training resources to meet local needs. Sixteen Regional Employment Boards (REB's) serve this function in the Commonwealth.

- The responsibilities of state agencies should be clarified to provide a coordinated basic skills/remedial education program and a coordinated industry- or cluster-specific program.
- To provide more effective industry-specific or cluster-specific training, a training "broker" can be used. The broker can help implement an effective industry-based training program in cooperation with an active industry association. The broker should be an established, non-governmental entity with close industry ties whose primary mission is job training. The broker can design training programs and select and monitor service providers. The Machine Action Project of central and western Massachusetts provides one model for such a training broker.
- A job guarantee component, where practical, can highlight the value of a training program both to funding sources and to potential trainees. Participating companies would be encouraged to guarantee a job, at least on a probationary basis, to a trainee who successfully completes a training program and meets standards established by the company.
- Funding flexible enough to carry out industry-specific job training is needed. Funding programs should allow for the retraining of the currently employed and training for individuals who do not fall within targeted groups. Since most restrictions are federal, this requires effective lobbying of federal law makers.
- An information management system should be developed to put timely and accurate information about the price, quality, and accessibility of services directly into the hands of firms and individuals. The system should track the post-training employment of individuals to allow training effectiveness to be measured.
- The training system should provide a clear common entry point for all individuals seeking training. The information management system described in the previous paragraph can be used to facilitate the provision of "one-stop shopping" for the system's individual users.

State education and training agencies already are developing new initiatives to help local industries become more competitive. Pilot programs are responding to needs identified by the software industry in the Greater Boston area and the machine industry in Hampden County. It is expected that additional programs will be developed in the near future as local industries begin to articulate their training needs to state and local policy makers.

Advanced Training Technology

Of special interest to Massachusetts is the substantial training expertise developed for the federal government by Massachusetts defense contractors. The Department of Defense seeks to use the best available training techniques to allow unskilled recruits to master complex, high technology systems. This expertise has not yet been fully applied to commercial training applications. It represents both an opportunity for improving the Massachusetts training system and a potential civilian business opportunity for Massachusetts defense contractors.

PERFORMANCE MEASURES

Placements and "Value Added". The basic measure of performance for the worker training system should be *placements in jobs for which training has been provided.* People should be trained for real jobs in the economy. The burden should be on those directing the allocation of the training system's resources to assure that training remains relevant to the needs of employers. This performance measure can be elaborated by seeking to measure other "value added" such as *meaningful learning gains achieved, wage levels before and after training, and length of employment following training.*

Surveys. The MassJobs Council proposes to conduct surveys in conjunction with industry associations to measure the satisfaction of employers with the training system. In particular, *surveys can be used to identify unmet training needs* and can provide the basis for the development of new training programs.

ACTION CATEGORY EIGHT: PROMOTING ADVANCED "KNOW-HOW" THROUGH AN INDUSTRIAL EXTENSION SERVICE

AT ISSUE: THE NEED TO MODERNIZE THE MANUFACTURING BASE

In order to improve productivity and compete with rival firms around the world, small and medium-sized Massachusetts manufacturing companies need to adopt modern "best practices" production technologies and methods tied to superior management practices and advanced skills.

Modern management and production methods and technologies such as Total Quality Management, computer-aided design and manufacturing, computer numerical control machinery and just-in-time delivery systems are altering the nature of manufacturing worldwide and creating a significant advantage to those companies that adopt them. Implementation of quality standards such as those developed by the European Community in its ISO-9000 directive can help companies gain access to new export markets.

While many firms, especially larger ones, are adopting these new practices, smaller companies often lack the resources and information needed to keep up with change. It can be a challenge for a sole proprietor or a small business to research evolving management and production techniques and to pay for new equipment and additional personnel to plan and implement these changes. Over 80 percent of all Massachusetts manufacturers employ fewer than 50 people, and 90 percent employ fewer than 100 people. Thus, problems that smaller firms could have in keeping up with change will affect the productivity of the state as a whole.

Existing services to help manufacturers modernize are already offered by a variety of state, federal and local programs. Some of the services offered include:

- The University of Massachusetts at Amherst's Center for Manufacturing Productivity conducts research in conjunction with small companies in applying best practices to production processes.
- The Bay State Skills Corporation Center for Applied Technology provides technical assistance to help small and medium-sized manufacturers adopt new technologies and forms of work organization.
- The Machine Action Project, funded by the Massachusetts Industrial Services Program, has been helping machining firms in the Pioneer Valley adopt new technologies and train workers to handle them.
- The Massachusetts Energy Advisor Service helps manufacturing companies take advantage of energy cost reduction opportunities, and plans to identify and develop new equipment and processes to increase energy efficiency.

A single Industrial Extension Service could focus specialized state resources such as training capacity and university expertise on helping small and medium-sized manufacturers adopt "best practices."

- The Massachusetts Office of Technical Assistance links industry with sources of technical information on new pollution prevention technologies and alternatives to toxic materials.
- The Department of Employment and Training, the New England Trade Adjustment Assistance Center, and others have been helping companies learn about and adopt new quality standards needed for export to the European Community.

While this list appears impressive, the services provided are disjointed and underfunded. Most are narrowly focused on a particular industry, a particular area of technology, or on specific categories of firms such as those who can prove that they have been hurt by foreign imports. There is no easy way for companies to sort through the various programs to gain access to what they need.

WHAT STATE GOVERNMENT CAN DO

A single *Industrial Extension Service* could unite current programs, seek new funding from federal and private sources, and focus its resources on specialized needs of small and medium-size manufacturers. Such a service, modelled on longstanding nationwide Agricultural Extension Service programs, could focus specialized state resources such as training capacity and university expertise on helping small and medium-sized manufacturers adopt "best practices."

The Industrial Extension Service should be organized as a single, statewide program directing available state and federal funds to service providers in different regions of the state. Ideally, the regional centers proposed in Action Category 12 would serve as companies' points of contact with the Service, consistent with the concept of one-stop shopping. Services could be provided on a subsidized fee-for-service basis, on a sliding scale depending on firm size, in order to leverage public dollars and to assure that the service is both valued and valuable.

The distinction between workforce training and the services associated with an Industrial Extension Service is sometimes blurred. The latter are primarily directed at management and relate to the actual systems, both managerial and technical, used to produce the firm's products. The changes brought about as a result of an Industrial Extension Service's assistance would likely create a demand for workforce training. An Industrial Extension Service should, therefore, be linked closely with the state's workforce training system.

An Industrial Extension Service could also be used to familiarize small manufacturers with productivity boosting pollution prevention

technologies such as energy conservation methods and toxic use reduction. An additional link to technology transfer programs could assist smaller companies that are involved in new product development of a technological nature, particularly companies involved in defense conversion.

Services provided through an Industrial Extension Service could include:

- Maintaining a knowledge inventory of management and engineering best practices for different manufacturing sectors.
- Providing access to that knowledge inventory through a variety of methods including maintaining a reference library, publishing informational pamphlets, conducting seminars, sponsoring conferences and maintaining an on-line data service.
- Conducting audits of companies to identify specific modernization needs. The Service might not be able to meet all of the needs identified, but it should function as a clearinghouse to connect companies with other service providers.
- Sponsoring industry networks, where appropriate, to broaden the reach of the Industrial Extension Service beyond those firms with whom the staff has direct contact. This would ensure that the Service provides a material economic benefit to the state by leveraging its impact to reach as many small Massachusetts manufacturers as possible.

PERFORMANCE MEASURES

An Industrial Extension Service will be effective to the extent that it results in manufacturers' adoption of "best practices" management and production methods. The Service should be required to measure and report *the percentage of small and medium-sized manufacturing firms assisted who actually adopted new production practices or technology and/or new management methods.* It may be possible for the Service to acquire data on actual productivity improvements achieved, subject to confidentiality considerations.

ACTION CATEGORY NINE: ENCOURAGING INNOVATION AND TECHNOLOGY TRANSFER

AT ISSUE: MAINTAINING OUR COMPETITIVE EDGE IN INNOVATION

Net job creation results primarily from innovation. Developing new products, improving existing products and reaching new markets all require a culture that encourages the sharing of knowledge and the transfer of technology from research centers and universities to companies.

As constant innovation and rapid introduction of new products becomes increasingly necessary for firms to compete worldwide, technology transfer is becoming ever more critical to the success of the Massachusetts economy.

Massachusetts has a competitive advantage in the amount and quality of scientific and applied research being carried on within its universities, hospitals and other institutions and private companies. The Commonwealth ranks in the top five of all states in the number of PhD scientists and engineers in the workforce, the number of science and engineering graduate students, the number of patents issued, university funded research and development (R&D) and Small Business Innovation Research grants (see Figure 5D).

As constant innovation and rapid introduction of new products becomes increasingly necessary for firms to compete worldwide, technology transfer is becoming ever more critical to the success of the Massachusetts economy. The Commonwealth must be prepared to compete even more vigorously — and in new and different ways — if the state is to maintain its historic leadership position in R&D and capitalize on its impressive scientific base. In order to create new jobs and new companies from our technology, the state and its leading research institutions must be at the cutting edge of technology transfer and commercialization.

Traditionally, Massachusetts outperformed other states in commercializing its research, in part because of M.I.T.'s encouragement of technology transfer. Many of the state's largest, most dynamic companies were founded on the basis of innovations emerging from Massachusetts' research centers. M.I.T.'s Licensing Office and the Massachusetts Biotech Research Institute exemplify active and successful private technology transfer

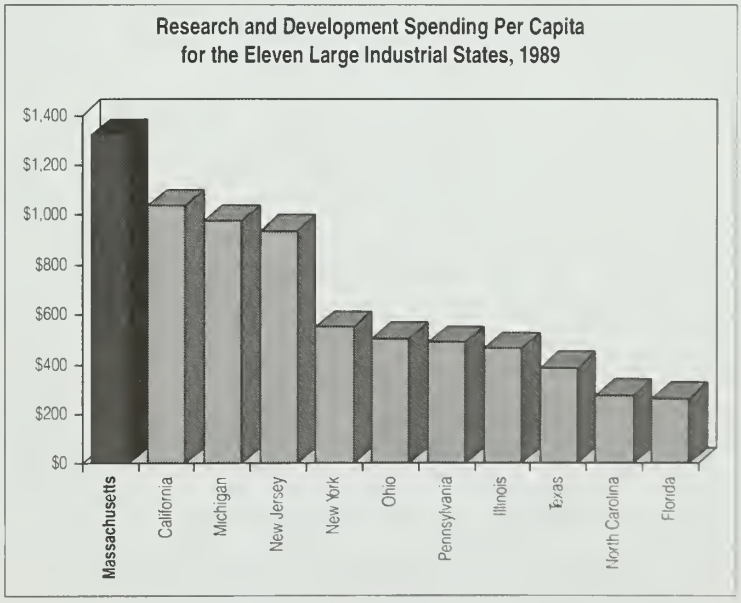


Figure 5D

operations. Such success cannot be taken for granted, however. In recent years, Massachusetts has been losing its share of federal research funds in the face of defense-related cutbacks and more intense competition for research dollars, particularly from states in the South and West that have made substantial public investments in science and technology programs. Further, today the process of technology transfer is often ad hoc; many opportunities are missed entirely, and many others are picked up and exploited by firms outside of Massachusetts. Massachusetts' existing successful technology transfer programs must be replicated around the state.

WHAT STATE GOVERNMENT CAN DO

The Commonwealth's goals for maximizing the economic development benefits of its R&D base include:

- Creating new models for bringing firms and university research facilities together in research and commercial partnerships.
- Helping Massachusetts firms compete for federal grants, especially those related to the conversion of military technology to commercial uses.
- Creating within the University of Massachusetts — the state's major public research institution — a new culture of entrepreneurship, programs to build closer ties to industry, new policies and administrative support for interaction, and new structures and mechanisms for collaboration.
- Increasing awareness of the research and technology capabilities of companies, universities and research centers based in Massachusetts with companies outside the state (and even abroad) that could purchase technology or collaborate on product development.

Creating Partnerships For The Promotion of Technology Transfer

The state should support the creation of technology partnerships between Massachusetts companies, universities and nonprofit laboratories. The functions of these partnerships would include:

- Facilitating the formation of collaborations between companies and the institutional research sector.
- Providing assistance in building proposal teams for federal grants and possibly seed money for proposal development.

Among all of the Commonwealth's research institutions, only the University of Massachusetts receives substantial support from taxpayers. The University therefore has a special responsibility to contribute to technology-based economic development. It has a substantial research base—over $100 million in federal and other support—on which to develop its role.

- Developing databases of firms and research activities in key technology areas.
- Exchanging information on new federal opportunities.
- Sponsoring trade shows and technical seminars on relevant scientific themes.

It is anticipated that federal agencies such as the Defense Advanced Research Projects Agency (DARPA) will provide hundreds of millions of dollars nationwide to industry for research and development of "dual use" technologies that can be converted from defense to civilian projects. The states whose companies will be the most successful in securing these contracts will do so by having some kind of collaboration in place between universities, research centers and industry. Technology partnerships would facilitate this. Partnerships could also help obtain anticipated federal dollars promoting industrial competitiveness, particularly within strategic technologies such as advanced manufacturing, computing, biotechnology and environmental technology.

These partnerships would be industry-specific. For example, a Regional Energy Technology Development Center is being developed now, along with a privately funded Energy Venture Fund, to encourage research, development and commercialization of environmentally-compatible energy efficiency technologies. These include electronics, instrumentation, advanced materials, batteries, motors, and related technologies for alternate fuel vehicles.

Expanding the Role of the University of Massachusetts

Among all of the Commonwealth's research institutions, only the University of Massachusetts receives substantial support from taxpayers. The University therefore has a special responsibility to contribute to technology-based economic development. It has a substantial research base — over $100 million in federal and other support — on which to develop its role. Each campus is uniquely positioned to contribute to the state's technology transfer goals in specific areas important to their region and to the state's economy.

- The University of Massachusetts at Amherst is already involved in technology transfer, spinning off 22 companies between 1986 and 1991. The Polymer Sciences Department has relationships with the leading private polymer research centers in the vicinity, General Electric's Pittsfield facility and Monsanto's facility in Springfield. The Computer Science Department's technology transfer system is described in the box on page 26.
- Other University of Massachusetts campuses' specialties include medicine and biotechnology at Worcester, advanced manufacturing at Lowell, environmental sciences at Boston and textiles and marine electronics at Dartmouth.

The University could participate with private industry in developing a new generation of incubators and shared use facilities where emerging companies could reduce their start-up costs by sharing space and administrative services in addition to receiving consulting services from university professors. By challenging each campus to develop synergistic relations with industrial clusters in their areas, substantial industrial development near the campuses could be generated, similar to what has happened in numerous other states throughout the country. The campus should undertake research to enable it to understand the competitive needs of the most important industries in its area.

Strong programs for technology transfer and commercialization which go beyond routine patenting and licensing functions need to be developed, with close ties to Massachusetts industry and investors.

- Industry leaders need to play a stronger role in direction-setting for the system and for individual campuses. Effective programs in industrial collaboration—such as the Center for Real-Time and Intelligent Complex Computing Systems (CRICCS) in the computer science department at Amherst—should be replicated and greatly expanded throughout the University system.
- Effective technology transfer mechanisms such as the Applied Computer Systems Institute of Massachusetts, Inc. (ACSIOM) at the computer science department at Amherst need to supported, replicated and expanded as appropriate.
- University policies, administrative procedures, hiring and promotion practices will all be re-examined in light of their support of the university's mission to develop a new spirit of economic entrepreneurship at all its campuses.
- The university needs to assess its legal and organizational capacity and flexibility to develop the kinds of creative interactions with industry required by the new economy and now commonplace among public universities across the country. Where unreasonable and impractical barriers exist, appropriate legal and legislative remedies should be pursued expeditiously.

In these ways, the University can become a national leader among public universities in its contributions to economic development.

PERFORMANCE MEASURES

Research and Development Spending. The major sources of R&D spending in Massachusetts are private companies, the federal government, and universities. The state should monitor the *level of corporate, government, and university R&D spending* compared to previous years and compared to the national average per capita. Massachusetts has historically done very well in these areas; it ranked second in the nation in university R&D spending in FY1990, with $149.39 spent per capita, and fifth in the nation in Federal R&D in FY1990 with $479.11 per capita.

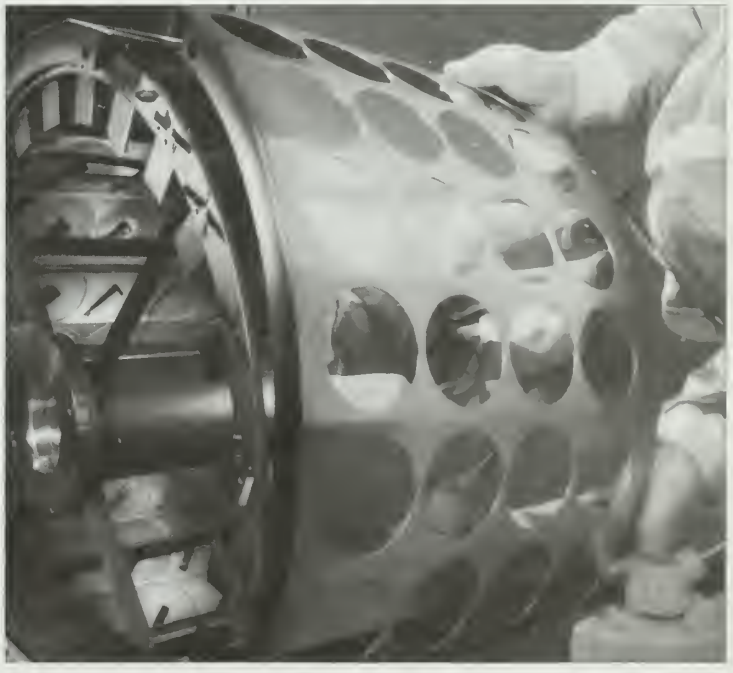
Technology Transfer. The state must also pay attention to the spin-off effects of research, by conducting surveys counting *the number of corporations spun off with faculty involvement at public and private higher educational institutions and federal and independent research labs.*

Patents Issued. The *number of U.S. patents issued to Massachusetts residents* and corporations is an indication of the intensity of research and innovation being carried out in the state. In 1990, Massachusetts ranked fourth among all states in the number issued per capita, with 351 patents per million of population. Massachusetts needs to continually excel at patented innovations, so should retain this ranking, but it also needs to turn these ideas into commercial products.

New Business Creation. As discussed throughout this *Strategy*, small businesses are a crucial part of the base of a healthy economy. While the Massachusetts economy has a large number of small businesses already operating, the state can improve its ability to encourage new business start-ups and expansions to take advantage of new markets and technologies. One way to measure *the number of small business start-ups per 1,000 population* is to look at state unemployment insurance files, because they include at least one employee who is covered by unemployment insurance. Such data do not include self-employed individuals, however.

Among the Commonwealth's greatest challenges and opportunities in the next several years is adapting military technology to commercial applications. Such laboratories as Raytheon's Advanced Device Center are at the leading edge of innovation.

Photo courtesy of Raytheon.



Technology Transfer in Action: The University of Massachusetts at Amherst

Activities taking place at the Computer Science Department of the University of Massachusetts at Amherst represent an extremely successful example of industry and university collaboration. Economic development is promoted through three separate but related entities:

- The Computer Science Department itself has a world-class basic research program.
- The Center for Real-Time and Intelligent Complex Computing Systems (CRICCS) is a research center for studying the commercial potential of the scientific work done in the Computer Science Department.
- The Applied Computer Systems Institure of Massachusetts, Inc. (ACSIOM) is a separate company that does the actual work of commercializing the technology.

Companies from a variety of industries and locations (both inside the Commonwealth and in other states) are members of CRICCS. Funding comes from member companies, the National Science Foundation and DARPA. In addition to paying membership dues each company is required to contribute a full-time research staff member. Industry members set the research agenda of CRICCS, which is tailored to their specific issues. This has led to the creation of three centers (laboratories) within CRICCS: the Center for Intelligent Information Retrieval, the Center for Autonomous, Real-Time Systems (working on intelligent robotics for advanced manufacturing) and Project Pilgrim (developing networks to allow very disparate computer systems to interface with each other). Four more centers will be started up in 1993 in the areas of intelligent vehicle and highway systems, educational technology, networking and real-time communications and extremely large software environments. These areas have excellent potential for helping to find commercial applications for defense-related technologies.

ACSIOM serves to complement CRICCS by performing the actual technology transfer functions. The research that is done in the CRICCS centers is customized in ACSIOM. ACSIOM performs licensing functions, puts together joint ventures, incorporates spin-off companies, provides education, training and consulting services and does marketing and distribution. Though it is a not-for-profit corporation, it also serves as a holding company for associated enterprises such as ACSIOM Labs, which is a for-profit subsidiary providing proprietary services to industry. ACSIOM also holds an interest, in the form of either equity or royalties or both, in the new start-up companies created with its assistance.

ACTION CATEGORY TEN: PROMOTING PRIVATE INVESTMENT IN PRODUCTIVITY AND JOB GROWTH

AT ISSUE: THE NEED TO INCREASE INVESTMENT

Achieving productivity improvement requires investment. Diversification of products and markets and the creation of new companies also requires investment. Companies undergoing restructuring in the face of intense competition must invest in the most advanced technology, and in the training of their workforce to adopt to new work methods. They must also invest in research and development because of their need to innovate. Innovation will in turn lead to the creation of new spin-off firms which will require further investment to launch and sustain. The goal is renewal and expansion that will propel itself and our economy forward; the fuel is the investment of "patient" capital in new ideas, equipment, plants, and in the education, training and retraining of our people.

The Credit Crunch

However, a credit crunch has been impeding the economy's ability to restructure existing businesses and grow new ones. As of this writing, the flow of credit to business enterprises remains unusually restricted, despite low interest rates. The dollar amount of commercial and industrial bank loans in Massachusetts fell by more than one third between the beginning of 1990 and the end of 1992.

- The number of bank failures in recent years and overall vulnerability of the banking system have been caused largely by the steep drop in value of the extensive real estate assets backing loans held by banks.
- This, combined with a sharp regulatory reaction to the national savings and loan crisis, has forced remaining banks to tighten credit, call loans and reject potentially credit-worthy business borrowers.
- Short-term working capital — of critical importance to small and medium-size businesses — has become hard to obtain even for successful growing companies.
- For small start-up companies, long-term equity capital also has become difficult to find as tax-advantaged alternatives and high transaction costs have swayed individual investors and venture capital firms away from funding start-ups.

One of the most powerful forces normally pulling economies out of recession is the ability of new and existing businesses with promising products and markets to take advantage of low interest rates in order to fund their creation and expansion. Substantial anecdotal evidence indicates that this pattern has been limited in this recession by the inability of troubled banks to provide short-term capital, and by a shortage of equity capital for small start-ups.

WHAT STATE GOVERNMENT CAN DO

Catalyzing Investment

It would be a mistake for state government to attempt to compete with the private sector as the lender of first or final resort for firms. But inaction, allowing the credit crunch and equity deficit to stifle modernization and new growth in the economy, is also a bad choice. The Commonwealth should strategically use tax policy and a small amount of public funds to stimulate much larger amounts of needed private lending and equity investment.

Encouraging Patient Capital and Early Stage Equity Investment

Massachusetts' current capital gains tax discourages equity investment in start-up companies and other businesses upon which the Massachusetts economy depends to create new jobs. Faced with a substantial tax on capital gains, investors put their money into tax-free bonds and other, less-taxed forms of investment that have a smaller impact on job creation.

Capital gains tax relief can provide incentives for investors to put their money into long-term equity holdings, particularly in start-up technology firms that need patient capital to see them through research and development phases. Governor Weld has proposed a graduated decrease in the level of state capital gains taxation depending on the length of time the asset is held, with a complete phase-out for assets held six years or longer. An incentive to hold assets longer means that existing businesses can shift from a short-run focus on profits and stock prices to a longer-term strategy that fosters growth and job creation. In the majority of cases, investment by Massachusetts taxpayers in small, start-up firms will be in local firms, given their proximity to the investors.

An ***early stage equity investment fund*** would also provide important assistance to new companies. Anecdotal evidence suggests that equity for start-ups and new companies represents one of the most severe "capital gaps" in the economy today. A possible structure for such a fund, based on state pension fund investments and an existing federal guarantee program, is described below:

- The program could utilize the Massachusetts mutual fund industry to raise capital along with the Massachusetts public pension funds.
- The program could take advantage of new Small Business Investment Company (SBIC) rules to leverage the capital base with federally guaranteed preferred securities and debt.

One of the most powerful forces normally pulling economies out of recession is the ability of new and existing businesses with promising products and markets to take advantage of low interest rates in order to fund their creation and expansion. Substantial anecdotal evidence indicates that this pattern has been limited in this recession by the inability of troubled banks to provide short-term capital, and by a shortage of equity capital for small start-ups.

- All the equity investments would have to be at the very early stages of company formation. Investments would be targeted to Massachusetts companies with high growth, job creation and capital return potential. Particular funds could target certain industries, or regions of the state.

Such a fund would complement early stage investing already carried out by the Massachusetts Technology Development Corporation.

Encouraging Investment in New Plant and Equipment

Massachusetts corporations face strong competition from around the world. Operating in a relatively high-cost location, these companies need high productivity and innovative, high-quality goods to compete successfully. Investment in new manufacturing and research facilities and machinery is an essential part of raising productivity and increasing competitiveness.

- An increase in the ***investment tax credit*** would help to provide the equipment and plants necessary for business modernization and growth. Using state tax policy as an incentive can encourage companies to make these investments at a cost to the public purse far lower than any direct assistance programs.
- The ***industrial energy efficiency programs*** offered by the Massachusetts Division of Energy Resources (DOER) in conjunction with gas and electric utilities can also be expanded to help target and strengthen investments in improved productivity.

Lending to Small Business

In recent years, the relative transaction costs of small business loans have made them less attractive to banks in comparison to large loans and investments in federal securities. However, small and medium-sized businesses are critical to Massachusetts' economic future. Working capital loans are essential for these businesses to fill new orders, to expand operations, and to pursue new markets. The Commonwealth should help reconcile these differences through targeted efforts to encourage bank lending to small business such as the ***Small Business Capital Access program*** proposed by the Governor and legislative leaders in September 1992.

Financing for Advanced Manufacturing and R&D Facilities

The Commonwealth should serve a leadership role in enabling our emerging industries to make the transition from R&D to manu-

facturing. The Commonwealth can use a variety of financing techniques, including partial loan guarantees and subordinate debt financing, to enable private financial institutions to make available the necessary construction loans. The credit problem is particularly acute for the biotechnology industry in Massachusetts as many firms enter the manufacturing phase. Other industries facing credit problems are those making "low-tech" products through high-tech processes. The goal is to create high quality, permanent jobs by leveraging private financing for highly productive, state-of-the-art facilities. The Governor's proposed ***Emerging Technology Fund*** is designed not to substitute for private financing sources but to share and reduce the risk associated with new facility financings. Loans would still be originated privately.

In addition to generating employment, there is an additional public benefit derived from helping emerging industries to build, manufacture and grow in Massachusetts. The professional service infrastructure — for example, bankers and insurers — needs to understand and adapt to the specific needs of technologically advanced industries. Each new client adds to the knowledge base in these service and other supporting industries. As these professionals learn how to serve the needs of these emerging industries, we create an even stronger base from which these industries can encourage others to do business in Massachusetts.

Financing Exports

Companies trying to enter foreign markets today generally find it difficult to obtain bank financing to fill orders originating in foreign countries. It is often hard to determine the stability and creditworthiness of foreign customers, and the income deriving from short-term export loans is often perceived as insufficient to outweigh their inherent administrative costs and financial risk. The Governor's proposed ***Export Guarantee Program,*** described in more detail in Action Category 11, is designed to fill this credit gap.

Quasi-Public Agencies

The Commonwealth's quasi-public agencies currently offer vehicles for the delivery of financing assistance to businesses in Massachusetts. However, their capacity to improve on private market financial terms is restricted by the limited direct public funding they have received historically. By far, most activity by the quasi-public agencies is in the form of revenue bond issues designed to capture federal tax exemptions and credits for affordable housing, institutional development, and limited types of commercial development such as pollution control facilities. The quasi-public agencies do, however, offer skills, experience, and some financial resources that can be used to promote private investment and job creation. An approach to making the quasi-public system more effective in assisting the state's efforts to promote economic competitiveness is discussed in Chapter 6.

The Commonwealth should serve a leadership role in enabling our emerging industries to make the transition from R&D to manufacturing. The goal is to create high quality, permanent jobs by leveraging private financing for highly productive, state-of-the-art facilities.

PERFORMANCE MEASURES

Public Investment. The Commonwealth should annually measure the *number of public dollars used by state and quasi-public agencies to stimulate private lending and investing in Massachusetts.* It should also track the *ratio of state funds to the number of private investment dollars leveraged.*

Corporate Investment. The Commonwealth should explore how to measure *investment in depreciable assets by Massachusetts manufacturing and service companies,* to show whether industries are investing in the new technology that will bring higher productivity.

Financial Institution Investment. *The annual percentage change in commercial and industrial loans outstanding at Massachusetts commercial banks* and the *private venture capital fund disbursements per worker* should be monitored.

ACTION CATEGORY ELEVEN: EXPANDING ACCESS TO EXPORT MARKETS

AT ISSUE: THE NEED FOR IMPROVED EXPORT PERFORMANCE

Creating new jobs requires reaching new markets. Throughout the industrialized world, companies are reaching beyond their home markets to take advantage of untapped demand and unexploited opportunities. Government and corporate policy must recognize and respond to the revolutionary growth of global market transparency in order to maintain a high standard of living and long-term industrial strength. Expanding markets is one of the chief available means to stimulate new job creation even as companies become more efficient.

The revolution in telecommunications has permitted international transactions to be executed almost as easily as those carried out within a country's borders. Improvements in international transportation have also facilitated the growth of world trade by dramatically reducing the logistic and cost impediments of moving goods between countries. Recent political and economic events have meanwhile eliminated many of the non-technological barriers to international trade. Although this process does impose a number of challenges upon business and industry, the internationalization of commerce simultaneously opens up a host of opportunities for innovative and aggressive firms. In addition to producing growth and profits for the individual companies, improved export performance can bring the state economy increased prosperity and jobs.

The growth of the export sector constitutes one of the most promising expansion and development prospects for the Massachusetts economy. Massachusetts' location offers advantages for exports of both goods and services to European countries, including shorter flying and shipping times and a less disruptive time zone difference compared to midwestern and west coast locations.

The state's information, environmental, and biomedical technology clusters hold particularly great export potential. Some of the Commonwealth's smaller niche manufacturers of specialty plastics, paper, machinery, specialty textiles and instrumentation products will also be able to expand their output dramatically by pursuing export markets. Many Massachusetts companies already are doing large shares of their business in foreign markets. For many firms, however, pursuing export markets is proving to be a complicated task. Figure 5E indicates that growth in Massachusetts goods exports in recent years has been rapid, but has trailed the performance of New England and the nation. The State should therefore pursue a set of policies which will help industry to overcome some of the technical, administrative and financial obstacles specific to foreign trade.

Expanding markets is one of the chief available means to stimulate new job creation even as companies become more efficient. The growth of the export sector constitutes one of the most promising expansion prospects for the Massachusetts economy.

WHAT STATE GOVERNMENT CAN DO

Improving Access to Export Finance

Companies that try to enter foreign markets today generally find it difficult to obtain the short-term financing they need to support the purchase of inputs and costs of production for foreign orders. Banks tend to refuse orders originating in foreign countries as collateral for loans because it is often difficult to determine the stability and credit worthiness of foreign customers. The income deriving from short-term export-related loans is furthermore perceived by many lenders as being outweighed by their inherent administrative costs and financial risks. Without some form of working capital assistance, however, many firms, and especially smaller firms, are unable to manufacture and ship their product abroad.

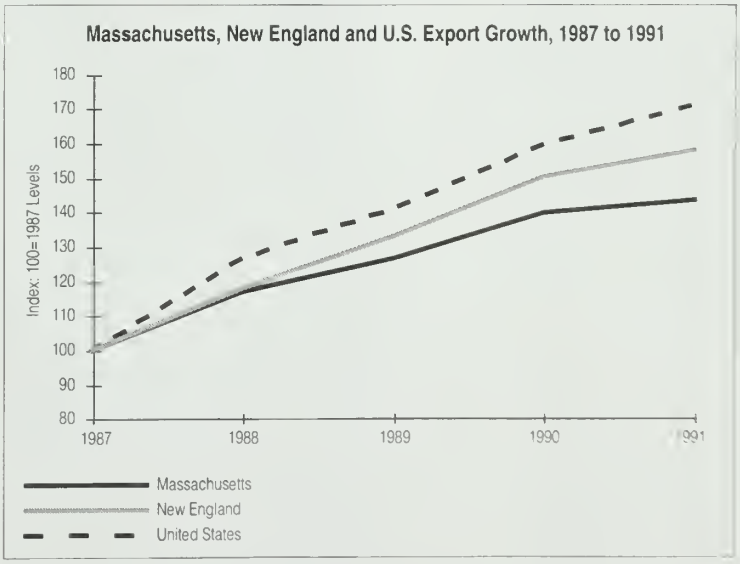


Figure 5E

Categories for Action

- *The Massachusetts Export Finance Program.* To meet the need for improved access to export finance, in September 1992 the Administration proposed an export guarantee program which will address the loan risk problem directly and thus allow Massachusetts firms to overcome one of their primary export barriers. The Program would be built around a flexible loan guarantee fund used to reduce bank exposure to credit risks stemming from export finance. The intention is to lower risk exposure to a level where export-based loans will become attractive to banks. The program is expected to significantly increase the volume of Massachusetts exports, raising state economic output, revenue and employment.

Export Promotion

The Massachusetts Office of International Trade and Investment (MOITI) is a publicly funded, not-for-profit corporation created to promote the export of Massachusetts-made goods and services, working primarily with small and medium-sized businesses. To achieve this end, MOITI provides Massachusetts companies with a host of programs, services and institutional functions that support and facilitate foreign market expansion.

- *Partners for Trade Seminar Series.* The Partners for Trade Program, developed in conjunction with the Massachusetts Small Business Development Center, holds dozens of seminars statewide each year to address the wide range of information needs encountered by companies seeking to market their products and services abroad. The program is run as a partnership of state, local and regional economic development organizations.
- *One-on-One Counseling.* The State provides new-to-export and new-to-market companies with one-on-one counseling on a variety of important export issues including marketing, finance, joint ventures, licensing, and many others. For new-to-market companies, MOITI has a group of regional specialists to provide detailed, country-specific information on foreign market needs, governmental regulations, trade risks, cultural barriers and political outlook.
- *Trade Leads.* For companies that are experienced exporters or have already received extensive counseling, MOITI furnishes trade leads on an on-going basis. The leads are electronically matched, according to product line and market interest.
- *Locating Distributors, Licensees and Agents.* Working with the Small Business Development Center and the National Trade Data Bank, MOITI also offers an electronic matching service to help companies identify potential agents and distributors in foreign markets.
- *Matchmaking Events.* Because joint ventures and strategic alliances are good ways to enter foreign markets, customize product lines and strengthen market positioning, MOITI offers a number of events that help companies meet potential partners. Matchmaking events in 1992 focused on markets and some specific industries in Indonesia, Italy, China, Canada, Ireland, and the former Soviet Union.

Trade Missions and Trade Shows

Since taking office, the Weld-Celluci Administration has led a total of 120 companies on trade missions to Czechoslovakia, Israel, Asia, Canada, Mexico, and Western Europe. Because they carry the imprimatur of government approval, trade missions are especially useful to companies that need access to foreign officials in order to negotiate a contract or penetrate a market. To date, trade mission-generated agreements represent approximately $100 million dollars in added exports, and about 2,000 Massachusetts jobs. These figures represent only a fraction of the business generated by the trade missions, since international agreements frequently take from three to five years to complete. Trade missions to Israel, Southern Europe and South America are planned for 1993.

Foreign Investment

More than 500 foreign-owned firms have operations in Massachusetts, employing approximately 80,000 local residents. The Commonwealth actively solicits additional foreign investment in Massachusetts. Because the U.S.-Canada Free Trade Agreement eliminated investment barriers, most of its recent recruiting efforts have focused on Canada. During the past year, Governor Weld and other State officials have undertaken investment missions to Toronto and Montreal. The Commonwealth's marketing initiative, described in the introduction to this chapter, will aim some of its efforts at attracting investment from foreign firms.

PERFORMANCE MEASURES

Overall Export Levels. Massachusetts' recent export performance has trailed behind both the New England and national averages by substantial margins. *Export growth for Massachusetts* for the 1990-1991 period was only 3 percent, compared to 5 percent for New England and 7.3 percent for the country as a whole. Massachusetts' concentration in services exports (including computer software) is not captured in these figures, however, which only measure the value of physical goods. In the near term, Massachusetts should aim to improve its export growth to at least match the national average. *Exports as a share of total state product* should be monitored, with the objective of increasing the share. A method of measuring services exports should be found, since this probably is the fastest-growing part of Massachusetts exports.

Percentage of Goods that are Exported. The Commonwealth could also measure the *percentage of goods manufactured within Massachusetts that are sold outside the U.S.,* and strive to increase that percentage.

International Access. Ease of access to and from Boston is important in encouraging foreign business transactions. This measure has two parts: access to the Commonwealth by air and by sea. The State should measure *the number of international cities over 1 mil-*

lion in population (outside of Canada and Mexico) served by direct and non-stop air service to and from Logan Airport, and the percentage of the 50 largest ports outside the U.S. served with direct service from the port of Boston.

ACTION CATEGORY TWELVE: FOSTERING GREATER STATE AND LOCAL COOPERATION FOR REGIONAL ECONOMIC DEVELOPMENT

AT ISSUE: ECONOMIC DEVELOPMENT BEYOND BOSTON

Though Massachusetts is a small state physically, the concentration of people and economic activity in the eastern part of the state — specifically, in and around Boston — sometimes leads to the false conclusion that not much is happening anywhere else. This perception can have negative consequences for the state as a whole. For example, business and economic development leaders from the regions outside Greater Boston have expressed concern that State economic development officials and staff from many of the State's quasi-public agencies have not focused sufficient attention on their areas, with two results: fewer resources are spent in these areas and statewide policies are written to reflect the viewpoint and respond to the realities of only Boston area economic development needs. The regional economic conferences held in the fall of 1992, and the regional focus of this *Strategy*, were one response to these concerns.

The ability to decide what each region of the state needs and how it should undertake economic development efforts must ultimately lie within the regions themselves. However, the Commonwealth has an important role to play: State government has access to resources that localities do not. In order for the Commonwealth to be a more effective participant in regional economic development, it must find a better way to direct those resources to regional needs and priorities.

This *Strategy* discusses the wide range of industries operating throughout the state. Again, this is an area where false perceptions exist, especially outside the state. Massachusetts is not all high technology, and high technology is not all Greater Boston. The concentration of industries in different regions of the state reflects the history and characteristics of those particular regions. The training needs of those industries are also region-specific, relying on the backgrounds of the people that live and work there. Even looking only at high tech, there are new technology-based businesses springing up all over the state — often reflecting the specialties of local universities and research institutes. Their operating characteristics and competitive positions will at least partly reflect where they are located.

WHAT STATE GOVERNMENT CAN DO

Developing a Network of Regional Economic Development Centers

The ability to decide what each region of the state needs and how it should undertake economic development efforts must ultimately lie within the regions themselves. However, the Commonwealth has an important role to play: people within state government have access to resources that localities do not. In order for the Commonwealth to be a more effective participant in regional economic development, it must find a better way to direct those resources to regional needs and priorities. The Commonwealth's systems for delivering economic development assistance to localities in finance, permitting, training, and other areas are currently fragmented.

confusing and inefficient. Employers outside Boston seeking assistance must find their way through a maze of "alphabet soup" agencies. Further, many of these agencies do not have an effective presence outside of Boston. This limits their awareness of regional issues and makes access to these agencies inconvenient for local businesspeople.

Thus, the Commonwealth should deliver economic development services that are responsive to regional needs on a one-stop shopping basis through a network of regional economic development centers. Five to seven regional offices would be established through which economic development services could be delivered locally. Services would include:

- Access to financial programs operated by state agencies and quasi-public organizations.
- Assistance with industrial modernization through an Industrial Extension Service.
- Access to other technical assistance, from export information to toxic use reduction, offered by state agencies and quasi-public organizations.
- Access to a restructured workforce development system, including industry-specific training brokers.
- Linkage to technology transfer activities going on in other parts of the state.
- Access to defense restructuring programs.

The staff operating each office would be familiar with both the needs of the region and the resources of the various state agencies operating these programs. Some of these offices might be located on University of Massachusetts campuses.

An important function of these regional offices would be to facilitate permitting for local businesses and planners by creating linkages to the responsible state agencies. Ultimately, regulatory and permitting contacts with business should also be made available on a regional, one-stop shopping basis, ideally in coordination with other business services. The Massachusetts Department of Environmental Protection is already moving to strengthen the regulatory and permitting assistance offered at its own regional offices.

Improving the Region-Specific Knowledge Base

One way that state government is taking responsibility for better meeting the needs of all of the Commonwealth's regions is by building up its understanding of the economy and resources of each region. The Regional Profiles that are part of this *Strategy* reflect the development of a knowledge base within state government.

Assisting With Regional Planning

Planning for economic development goes on at the local, regional, and state levels, yet each may not have enough knowledge of what the other is doing to create synergies between them. If state and regional resources are to be coordinated, it is important to know what the policies and programs that are being coordinated are attempting to achieve.

Each region of the state should develop its own vision of a desired economic future and the steps needed to achieve that vision.

Each region of the state should develop its own vision of a desired economic future and the steps needed to achieve that vision. Local attempts to reach a consensus on issues of regionwide importance and to develop shared services cutting across municipal boundaries should be encouraged and promoted at the state level. There should be consistency between state and local strategies, especially regarding the Commonwealth's role in implementing the regions' priorities.

One way of assisting local efforts is through the Executive Office of Communities and Development, which has restored funding for its Strategic Planning Program to help communities, groups of communities or regional organizations create such economic development strategies.

As the regions develop their plans and require state participation in their implementation, the issue of communication is increasingly important. The Commonwealth will develop stronger planning and working relationships with local and regional bodies statewide concerned with economic development. The process of dialogue that was developed during the series of conferences that form the backbone of this *Strategy,* and the regional policy plans that are part of the Regional Profiles, can form the basis for a continued relationship between the state government and the local and regional entities most concerned with economic development. The Executive Office of Economic Affairs has encouraged efforts of local and regional bodies to communicate their concerns and share information about local opportunities by inviting staff of state agencies and quasi-public organizations to meetings in their localities. The Commonwealth is committed to working with and listening to groups that are concerned with region-specific solutions.

PERFORMANCE MEASURES

State Services to Regions. Once the network of new regional centers has been established, its performance should be measured in terms of both the quantity and quality of services provided to the regions. For example, the creation of regional centers should increase *the percentage of state and quasi-public financial assistance for job creation that flows to regions outside Greater Boston.*

Regional Economic Strategies. Another objective should be the development, for the entire state, of regional economic strategies consistent with this *Strategy.* Some regions have already prepared such strategies and are ready to move to coordinating those strategies, and their implementation, with the Commonwealth.

Chapter 6

Organizing the Government to Promote State Competitiveness

Publication of this *Strategy* reflects a policy commitment to improving the competitive position of Massachusetts in the world economy in order to promote job creation and economic growth. Implementing its policy recommendations will require the coordinated action of the entire state government.

Implementation is the key to any successful strategy. Several critical changes to the structure and procedures of Massachusetts state government would vastly increase its ability to pursue the agenda for economic competitiveness set forth in this document. The most important of these changes relate to the coordination of government functions. This chapter describes organizational changes to promote both **strategic coordination** and **project coordination**. Strategic coordination, in the context of this *Strategy,* refers to the need for the government to pursue a consistent agenda for economic competitiveness across its diverse agencies and departments. Project coordination refers to the need for diverse staffs within the government to respond to the needs of individual economic development projects in a unified rather than fragmented way.

STRATEGIC COORDINATION

This *Strategy* is the product of hundreds of hours of meetings and conferences across the state, thousands of hours of research and data collection, and the review and consideration of officials throughout state government. Its recommendations embrace the agendas of several secretariats.

Publication of this *Strategy* reflects a policy commitment to improving the competitive position of Massachusetts in the world economy in order to promote job creation and economic growth. Implementing its policy recommendations will require the coordinated action of the entire state government.

Operating Budget and Capital Budget Planning

The Commonwealth's principal documents for the expression and implementation of policy for the government as a whole are the state operating and capital budgets. Each year, the Governor submits an operating budget proposal to the legislature, which is based in substantial part upon the recommendations of each of the secretariats. The formulation of a final budget through a political dialogue between the legislature and the executive is the fundamental process by which priorities for the Commonwealth are set. A capital budget is also developed by the executive branch each year based on legislative authorizations of capital spending.

The most appropriate means of achieving the strategic coordination necessary to implement this *Strategy* is to establish a mechanism for assuring that the operating budget proposal to the legislature and the state capital budget are consistent with the goals and recommendations of this *Strategy.* The Executive Office of Administration and Finance is the secretariat responsible for preparing the two budgets in a manner reflective of the policy priorities of the Governor. Therefore, a strategic planning function is needed, either within the Governor's Office or within Administration and Finance, in order to assure that the State's broad economic development agenda, as articulated in the *Strategy*, is implemented effectively through the budget priorities expressed in the operating and capital budgets.

Regulatory Activity

The state operating and capital budgets govern most, but not all, state actions which substantially affect the economy. The promulgation of state regulations represents a type of state action that can have a profound impact on economic competitiveness, but may not be reflected in a budget line item. A second role for a strategic planning function in the Governor's Office or Administration and Finance would be to review fiscal and small business impact statements required by law to be prepared in connection with any proposed new regulations.

Pursuant to Chapter 30A, Section 5, of the General Laws, the existing rulemaking process requires agencies that are proposing new regulations to state the public and private sector fiscal impact of the proposed regulations and the impact of the proposed regulations on small businesses. While these requirements could be very useful, the statements that currently accompany most proposed regulations are uninformative, *pro forma* addenda. This is understandable.

Organizing the Government to Promote State Competitiveness

Agencies whose mandates have little direct relationship to promoting economic growth have been given no guidance on how to define "public and private sector fiscal impact", or on how to evaluate the economic impacts of proposed regulations. As a result, agencies typically limit their statements to an estimate of the dollar value of new fees, new equipment, or compliance procedures.

The fiscal and small business impact analyses required by law should go beyond this *pro forma* accounting. Agencies should examine proposed regulations to evaluate the extent to which these regulations will promote or hinder the achievement of the goals and policies for increasing economic growth and competitiveness.

The intention is not that this *Strategy* be used to prevent the promulgation of new regulations that impose a cost on business. On the contrary, the *Strategy* recognizes that the quality of life enjoyed by Massachusetts residents depends on both economic and non-economic factors. A balanced assessment of proposed regulations must, however, take into account the impact of proposed regulations on the Commonwealth's future economic prospects.

To implement this recommendation does not require new legislation. However, new rulemaking guidance should be given by the Executive Office of Adminstration and Finance to the regulatory agencies regarding how to carry out the mandate of Chapter 30A of the General Laws in light of this *Strategy*. Furthermore, the review of fiscal and small business impact statements prepared in connection with new regulations should be carried out through the same strategic planning function responsible for reviewing the state operating and capital budgets. This is important to assure that all of the regulatory agencies of the Commonwealth are working on the basis of a common understanding of the Commonwealth's economic agenda.

In summary, a strategic planning review function, located within the Governor's Office or within Administration and Finance, can help assure that strategic coordination is achieved in state government through review of the State's operating and capital budgets and major regulatory promulgations in support of the Commonwealth's goals for job creation and economic competitiveness.

Ongoing Strategic Planning

In addition to the coordination functions described in the previous sections, ongoing research and evaluation is needed to assure that strategic planning in support of economic growth remains effective over the long-term. These functions can best be carried out by the Economic Policy Research Unit at the Executive Office of Economic Affairs. As it did in preparing this *Strategy*, the Economic Policy Research Unit would work in coordination with the Governor's Office, other secretariats, the University of Massachusetts and regional and local officials. This policy research function in Economic Affairs would remain distinct from the strategic planning function proposed for the Governor's Office or Administration and Finance. Three principal functions are part of this ongoing research and evaluation role:

- While every effort has been made in this *Strategy* to capture the best thinking in the Commonwealth regarding how the Commonwealth can promote economic competitiveness and job creation, the document remains a work in progress. Issues, priorities, and opportunities change quickly, and the *Strategy* should be updated regularly to reflect change as it occurs.
- This *Strategy* suggests a number of performance measures to be used to assess progress towards achieving the *Strategy's* objectives. The Policy Unit should evaluate these performance measures on an ongoing basis, and make the results available to policymakers and the public.
- The Policy Unit should also work with organizations and governmental units at the regional and local levels to promote the preparation of economic development strategies at these levels in coordination with the Commonwealth.

PROJECT COORDINATION

Addressing the Issue of Fragmentation

Strategic coordination relates to the "macro" level of state government operations — the processes by which fundamental public policy priorities are set and implemented. In contrast, project coordination can be thought of as relating to the "micro" level of government operations — particularly, to the interaction between government staffs and private business enterprises seeking to expand their operations or locate new facilities in the Commonwealth.

The decision of private investors to locate or expand a significant facility in the Commonwealth — especially in the absence of boom conditions — generally represents an economic development success story. Such a decision represents a commitment to grow in Massachusetts and a vote of confidence in the state's economic future. New construction means immediate (though temporary) jobs. New or expanded facilities generally also mean new permanent employment. Assuming the facility or expansion can be sited in an environmentally sound manner with adequate infrastructure support, there is every reason for the Commonwealth to work to make it easier for new projects to go forward.

The State's role in any sizable new project almost invariably is substantial. Such involvement can range from assistance with financing arranged through one of the State's economic development quasi-public organizations to air quality permits for a new heating plant obtained from the Department of Environmental Protection.

From a structural standpoint, the main hindrance to the State's ability to encourage new project development is fragmentation; the scattering of related functions among multiple independent staffs. Its causes lie in the

Organizing the Government to Promote State Competitiveness

fact that government grows by accretion, rather than grand design. Government is the ultimate "joint enterprise", reflecting the democratic process played out over generations and countless individual political acts and decisions. In general, new programs and staff functions are easily added to the government's repertoire, but existing ones are difficult to terminate. Programs and functions that bear on the same issue are not necessarily assigned to the same staff for political, budgetary or other reasons. Natural as this fragmentation is to government, it is damaging to government's ability to work efficiently and constructively with project proponents. Some of the problems created are:

- From an internal perspective, fragmentation frustrates the ability of government managers to carry out a coherent agenda. When resources and staff relevant to a particular government objective are so scattered that lines of reporting and responsibility only converge at the highest levels, a coordination problem exists. This is particularly damaging to projects, since the issues that must be resolved are often highly specific — too much so, in fact, for a high level policymaker to steep himself or herself so deeply in the facts so as to be able to resolve them personally.
- Scattered resources also tend to create a "critical mass" problem. Individual staffs may lack the resources to make a real difference to a particular objective, but may, nevertheless, be resistant to initiatives that combine the resources of several staffs when this could ultimately mean loss of authority or even employment.
- From the perspective of those outside the government, the problem of fragmentation results in frustration and wasted time. For a project in which the State plays multiple roles, time and expense are wasted as the proponent seeks to identify the staff or staffs responsible for each relevant government function and to satisfy the expectations of each staff independently. The private proponent must "connect the dots," in the absence of the government's ability to coordinate its own operations.

There are four key functional areas in which fragmentation poses a particular problem both for government managers and for private project proponents. These four areas are:

- The delivery of economic development assistance, particularly through the State's quasi-public organizations.
- Capital spending for public infrastructure in support of private economic development projects.
- The delivery of training assistance.
- Environmental permitting and project approval.

From a structural standpoint, the main hindrance to the State's ability to encourage new project development is fragmentation; the scattering of related functions among multiple independent staffs. Natural as this fragmentation is to government, it is damaging to government's ability to work efficiently and constructively.

Addressing the problem of fragmentation in these four functional areas will substantially improve the effectiveness of government in support of job creation in the Commonwealth.

Economic Development Assistance

Economic development assistance means the assistance that the Commonwealth provides to employers to encourage employment stabilization and job creation. This can take several forms, including assistance with financing (such as reduced-interest loans, loan guarantees and other forms of credit enhancement), the provision of equity capital, and technical assistance provided to small business owners and managers. (The provision of training assistance is discussed separately below.)

Most of this assistance is delivered through ten separate quasi-public organizations, loosely affiliated with the Executive Office of Economic Affairs, and three independent "public purpose corporations." Each of these entities has its own board, staff, and budget. The problem of fragmentation is quite pronounced with employers complaining of an "alphabet soup" of acronyms denoting agencies with complex, overlapping jurisdictions and, in most cases, meager resources.

The report of a special commission appointed by the Governor in 1992 to study the State's economic development system recommended the coordination of the ten quasi-public organizations under a single umbrella board of directors. To date, this recommendation has found little support in the legislature. The quasi-public organizations have recommended voluntary forms of increased coordination among themselves. Whether achieved legislatively, or through effective voluntary and cooperative action, coordination is the reform desperately needed for the economic development delivery system. Such coordination should achieve at least the following:

- *One-stop shopping.* Potential users of the system should not have to figure out who to call for a particular type of assistance. There should be a single point of entry, where potential users would be efficiently directed to the correct staff. A single application form should be established that is accepted by all organizations within the system. A single point of contact should be available throughout the application process so that the applicant can interact with a single, competent staff member in pursuing assistance.
- *One-stop decision-making.* In the absence of legislative action to coordinate the board activities of the quasi-public organizations, the boards should establish procedures whereby projects that require assistance from multiple organizations can obtain coordinated board actions.

Organizing the Government to Promote State Competitiveness

- ***Regional centers.*** A commitment to "one-stop shopping" does not mean that employers from across the state should have to travel to Boston to obtain assistance. Advice and access to the economic development assistance system should be available through a network of regional centers located strategically throughout the state.
- ***Rapid response capacity.*** Frequently, state government is called upon to respond quickly to a company that is considering investing in (or leaving) the Commonwealth. A proposal that summarizes the available assistance from multiple organizations can be instrumental in obtaining an investment commitment. The economic development organizations should be capable of preparing and delivering such a proposal on short notice.
- ***Strategic direction.*** An effective mechanism must be established to assure that the resources of the quasi-public system are directed strategically in accordance with a coherent agenda for economic growth. At a bare minimum, this requires institutionalized communication regarding budget priorities among the directors of the relevant organizations, and with the Executive Office of Economic Affairs. Priorities should reflect the policies and recommendations set forth in this *Strategy*.

Economic Development Capital Spending

The second substantive area in which the problem of fragmentation hinders the achievement of the State's economic development objectives at the project level is capital spending for public infrastructure in support of private economic development projects. Infrastructure spending has always been used as a means of promoting private economic development. Roads, rail facilities, airports or seaports, and other publicly-financed infrastructure elements are essential to the conduct of business.

Responsibility for administering the State's capital expenditures is divided among several secretariats and offices, with the most important historically being the Executive Office of Transportation and Construction, the Division of Capital Planning and Operations within the Executive Office for Administration and Finance, the Executive Office of Communities and Development, and the Department of Environmental Management within the Executive Office of Environmental Affairs. Authorizations for spending in support of economic development have been included within the capital budgets administered by all of these secretariats and agencies.

In some instances, a particular project or group of projects can be furthered through public infrastructure improvements or extensions. Programs such as the Public Works Economic Development (PWED) Grant Program, administered by the Executive Office of Transportation and Construction; the Community Development Action Grant (CDAG) Program, administered by the Executive Office of Communities and Development; and grants for water purification and sewage treatment plants administered by the Department of Environmental Protection (DEP), have historically provided capital funds for public infrastructure in support of specific private projects.

At present, there is no cross-cutting mechanism that is effective on a project-by-project basis to assure that state capital expenditures in support of economic development are allocated strategically to achieve the greatest potential benefit in job growth and increased competitiveness. A number of the state offices managing capital funds do not have economic development as their primary mandate, further complicating the problem of establishing priorities.

The solution to this problem is probably not the consolidation of responsibility for all capital spending in support of economic development projects in a single office, other than the Office of the Governor. However, the Executive Office of Economic Affairs should be given responsibility for preparing a summary of all such proposed capital expenditures statewide so that the Governor has the means ready to set priorities and coordinate expenditures. The priorities established through this mechanism should be implemented through Administration and Finance's review and approval of all state capital spending. Allocating a portion of the State's overall budget to the joint direction of the Executive Office of Economic Affairs and the Division of Capital Planning and Operations to create a five-year, $500 million economic development capital program has also been proposed as a means to assure that increasing statewide competitiveness is the primary objective of at least a portion of the State's capital budget.

Workforce Training and Development

The third area in which fragmentation impedes the Commonwealth's ability to support economic development projects is workforce training. Here, fragmentation is extreme, driven largely by complex federal mandates. Workforce training assistance in the Commonwealth is delivered through four secretariats — Economic Affairs, Labor, Health and Human Services, and Education — and numerous subsidiary agencies. The MassJobs Council, which was established to develop a more effective workforce training system and which is now chaired by Lieutenant Governor Cellucci, has inventoried over $365 million per year in existing state and federal spending for training in the Commonwealth. What the MassJobs Council has discovered is a fragmented and inaccessible system which, despite this high level of expenditure, can offer only limited assistance to an individual company seeking to upgrade the skills of its workforce or to hire new workers.

The MassJobs Council's interim recommendations to the Governor are set forth in a report entitled "Building a World Class Workforce Development System in the Commonwealth," delivered to the Governor

on December 10, 1992. The Council's stated overall objectives for the workforce training system are as follows:

- The system should, wherever possible, emphasize a "demand" or customer-driven perspective, not a "supply" or program-driven (and provider-driven) perspective.
- The system should be understandable to its customers and easy to use.
- The system should be performance driven.
- The system should be administered locally, but guided centrally.

The best strategy for bringing coordination to the workforce training programs of the Commonwealth is continued support for the work of the MassJobs Council. More detailed recommendations developed in cooperation with the MassJobs Council are set forth in Chapter 5 of this *Strategy*.

Project Permitting

The fourth area in which the problem of fragmentation imposes unnecessary costs on businesses and limits the effectiveness of the Commonwealth's job creation agenda is the process for granting permits and approvals to individual projects.

Process problems associated with permitting should be distinguished from the regulatory reform agenda, discussed in Chapter 5. Regulatory reform is motivated by the premise that there are outdated, duplicative, or simply over-reaching regulations on the Commonwealth's books that impose a substantial cost on businesses without achieving a clear, justifying public purpose. Permit streamlining — the objective of the reforms described in this chapter — is concerned with regulations that have a sound public purpose, but which are implemented through procedures that impose unnecessary costs or delays.

Again, the problem is primarily one of coordination. Responsibility for project permitting is divided among expert staffs in several agencies and secretariats. Many of these regulatory programs are administered by staffs

The streamlined state and local permitting process that allowed Genzyme Corporation to begin work on its Allston biopharmaceutical manufacturing plant in record time should be the rule, not the exception.

Photo courtesy of Raytheon.

within the Department of Environmental Protection. However, project review responsibility for certain permits are located in other agencies as well. For example, curb cut permits are issued by the Massachusetts Highway Department. Project review under Chapter 91 of the General Laws (waterways licensing) is shared by the Massachusetts Office of Coastal Zone Management, located outside of the Department of Environmental Protection, and the Waterways Division within the Department of Environmental Protection. Other permits critical for particular projects are issued by yet other agencies and offices. In many cases there are also federal regulatory requirements imposing additional hurdles on the permitting process and, at times, acting as constraints on the state decision-making process.

Just as significant as the fact that responsibility for project review is divided among numerous staffs is the fact the each permit must be issued in accordance with the requirements of separate statutory and regulatory authority. The result is that procedures and deadlines for project review pursuant to different permitting requirements do not necessarily coincide. Certain staffs have taken the position, under their regulations, that their review cannot commence until project reviews by other staffs have been completed. Generally speaking, this is not helpful.

Participating in the entire project review process is the State's MEPA Office, located within the Executive Office of Environmental Affairs, with responsibility for the implementation of the Massachusetts Environmental Policy Act (MEPA). MEPA and its implementing regulations require the proponent of a project that exceeds certain environmental impact thresholds to prepare an Environmental Impact Report, setting forth information necessary for project review in connection with any state involvement in the project, including permitting. The Environmental Impact Report is reviewed by the MEPA staff and ultimately by the Secretary of Environmental Affairs for accuracy and completeness in accordance with a set of strict deadlines.

Many project proponents find the MEPA process cumbersome. Nevertheless, it does provide a form of "one-stop shopping" as a single forum within which all of the environmental issues relevant to state involvement in a project can be aired and reviewed. However, the MEPA Office is not responsible for overseeing and coordinating the permitting process. Approval by the Secretary of an Environmental Impact Report is not synonymous with the granting of the multiple permits that the project may require. Despite MEPA, permitting staffs frequently gather their own information from project applicants, and the permitting process often continues after the MEPA process is completed.

Comprehensive permit streamlining is needed. Although this is an ambitious goal, the Commonwealth must move ahead in this

direction. The objectives of such streamlining should be the following:

- ***Single point of entry.*** There should be a single point of entry to the project review system. This point of entry should provide an authoritative determination of all state permits and approvals that are needed for the project. This "scoping process" could be structured to create an incentive for an applicant to provide complete and accurate information about the project at this initial stage in the permitting process. After the determination, additional permit requirements could be imposed on the project only if new or previously undisclosed, relevant information regarding the project came to light, or in the event of actual changes in the law. DEP has moved in the direction of initial "scoping sessions." However, DEP's jurisdiction is limited to its own permits and approval. The MEPA process provides a similar scoping process, but MEPA is not a permitting agency. The appropriate authority for the scoping process must be able to examine the project for all state permits and approvals.
- ***Single point of contact.*** There should be a single point of contact within the State for each project undergoing project review. While DEP will provide a single contact for all DEP permits, there should be a "case officer" or "project manager" who can act as a liaison between the project proponent and the reviewing staffs of the various agencies. He or she should be aware of the status of the project review, and should be able to act as a project "advocate" to identify any potential problems with the project that could delay permitting and resolve procedural roadblocks within the permitting agencies that could prevent prompt review.
- ***Unified information transfer.*** There should be a unified process for information transfer. A single submittal to the State should be sufficient for all required permits. The Regional Offices and the MEPA process both offer existing vehicles for coordinating the information transfer process.
- ***Coordinated, timely review deadlines.*** DEP has succeeded in providing greater reliability and predictability in the timelines for specific permit determinations. The next step is to coordinate the various deadlines for review with respect to all permits, where feasible. The review process should be able to come to a timely and coordinated conclusion. Although some project proponents may prefer the existing staggered review process, the various agencies and staffs should also provide a procedure to conduct their permit reviews in parallel, rather than consecutively.

To create a competitive environment for new investment and growth in Massachusetts, the state government itself must change.

The objective of these changes is not to lower the review standards applicable to new projects. The objective is to provide a review process that is speedier, more predictable, and less costly to project proponents. Portions of this vision of streamlined permitting have already been implemented. Accomplishing the entire program will be challenging. Some regulatory changes, and perhaps legislative changes, will be necessary to coordinate deadlines.

However, the negative impact of lack the of coordination in the existing system of project permitting is no less serious than the negative impact of the lack of coordination in the areas of economic development assistance, capital planning, and workforce training. To create a competitive environment for new investment and growth in Massachusetts, the state government itself must change.

Achieving Overall Project Coordination

Fragmentation is a problem in each of the four functional areas, examined above. It is also a problem *among* each of these areas. A large and important economic development project, offering the prospect of significant new employment, may involve actions by the Commonwealth in each area. Assistance in financing may be provided through a quasi-public organization, state capital funds may be used to supplement municipal capital spending to develop the infrastructure necessary to support the new employment, job training assistance may be necessary, and almost certainly the project will require multiple state permits. In addition to coordination within each of these substantive areas, there is a need for an overarching level of coordination that remains project-specific.

An Intergovernmental Council was established in 1992 by the Weld-Cellucci Administration as a cabinet-level vehicle for the discussion of economic development priorities.

The Council is chaired by the Secretary of Economic Affairs and includes the Secretaries of Adminstration and Finance, Communities and Development, Environmental Affairs, and Transportation and Construction. The Commissioners of Business Development, Capital Planning and Operations and Environmental Protection and the heads of the Massachusetts Bay Transit Authority, Massachusetts Highway Department, Massport, and the Massachusetts Turnpike Authority are also members of the Council. The Council is the appropriate forum for resolving conflicting agency-level priorities as they arise on specific projects. This can simplify and expedite the process of working with the Commonwealth from the perspective of individual project proponents.

Achieving project coordination may be even more challenging than achieving strategic coordination. However, the Commonwealth's reputation as a place that is friendly or hostile to business growth and expansion rests substantially on the treatment each project receives in its dealings with state government.

Chapter 7: Crosscutting Issues

This chapter highlights four complex issues: urban revitalization, rural and small city development, defense restructuring, and small business development. These issues are "cross-cutting" in that they are best addressed through an application of several action categories outlined in Chapter 5 of this document.

Urban and rural economic development are presented as examples of how the recommendations of this *Strategy* can be applied to achieve the vision of broad economic opportunity. The complex needs of urban and rural areas require a comprehensive set of solutions. Pockets of urban and rural distress have, even in boom times, fared substantially worse than the state as a whole in terms of employment and other socioeconomic indicators. In light of the recent downturn in the state economy, the need for direct action in distressed areas is especially pressing. This chapter outlines a vision of equitable economic activity and opportunity through a combination of targeted investment, training and regulatory policies.

The issue of defense restructuring is presented as a case study in how the elements of this strategy can be applied to a major sector of the economy undergoing rapid change. The Commonwealth's large number of defense-related companies are being severely affected by Department of Defense cutbacks. In order to make a transition from defense to commercial markets, Massachusetts' defense dependent industries will benefit from the assistance of state government in a variety of areas including: technology transfer, worker training, industrial extension services, and tools to facilitate investment.

The Commonwealth's economic prosperity traditionally has been dependent upon the ability of new and small businesses to generate jobs. The state's network of high technology manufacturers, universities and research institutions has been a powerful generator of spin-off firms. In recent years, however, the percentage increase in new business incorporation in the state has trailed that of the nation. A combination of factors, most notably the drying up of credit available to small businesses, is responsible for this trend. In order to promote the growth of small businesses, the Commonwealth must target energies towards these enterprises in such areas as investment, worker training, the regulatory environment, and business costs.

Real change in our urban neighborhoods can only be effected through a partnership among government, business, community-based organizations and individuals dedicated to job growth—sharing the risk, the responsibility and the success.

ISSUE NUMBER ONE: REVITALIZING DISTRESSED URBAN ECONOMIES

DEFINING THE ISSUE

Our cities represent a core of cultural and economic activity, and showcase the best of our people's talents. They are our financial centers, our medical centers, and our centers of higher learning. Our cities link us with the rest of the world, and serve as a magnet for people to come live and work in Massachusetts.

However, the need for job creation and community improvement in our cities, and particularly in their neighborhoods and communities of color, is severe. The Commonwealth's urban neighborhoods and minority communities experience unemployment and poverty rates far higher than the state average, and are often characterized by deteriorating housing, aging public facilities, and inadequate retail and banking services. Figure 7A compares socio-economic statistics in some of the Commonwealth's major cities to statewide averages. As can be seen from Figure 7B, many of the Commonwealth's cities have a large percentage of their population falling below the poverty line.

Real change in our urban neighborhoods can only be effected through a partnership among government, business, community-based organizations, and individuals dedicated to job growth—sharing the risk, the responsibility, and the success. It is within this context of partnership that we can eliminate barriers to opportunity, and expand options for inner-city residents. We can preserve the socio-economic diversity of urban centers and "grow" a new middle class through expanded opportunity.

Comparison of Economic Indicators Between Massachusetts and Selected Cities

Economic Indicators	State	Boston	Worcester	Springfield	Lowell	New Bedford	Fall River	Lynn	Lawrence	Holyoke	Chelsea
Unemployment Rate (1992 Average)	8.5%	7.7%	9.2%	10.7%	11.5%	13.4%	13.5%	10.1%	13.3%	10.3%	11.7%
Per Capita Income	$17,224	$15,581	$13,393	$11,584	$12,701	$10,923	$10,966	$13,026	$9,686	$11,088	$11,559
Percent of Population Below Poverty Line	8.9%	18.7%	15.3%	20.1%	18.0%	16.8%	14.3%	15.9%	27.5%	25.7%	24.1%
Percent of Children Below Poverty Line	12.9%	28.0%	24.8%	33.2%	29.2%	26.7%	21.4%	26.1%	41.9%	43.0%	45.1%
Percent High School Graduate or Higher	80.0%	75.7%	72.9%	69.6%	65.8%	49.7%	46.7%	73.2%	57.0%	68.0%	63.2%
Percent Bachelor's Degree or Higher	27.2%	30.0%	21.1%	15.0%	15.5%	9.7%	8.4%	14.3%	9.7%	15.2%	12.0%

Source: U.S. Census, and Massachusetts Department of Employment and Training

Note: All Data is 1990 , unless otherwise noted.

Figure 7A

THE COMMONWEALTH'S ROLE

The two primary goals behind the state's urban strategy are to create jobs and businesses in the inner city and to revitalize the physical environment of urban neighborhoods.

The best social program is a job—this is true from the perspective of personal empowerment, and it is also true from an economic perspective. The cornerstone of the urban investment strategy is to use public resources in the most efficient way to leverage private investment. Private investment has the greatest power to create economic opportunities and to improve the built environment. Government alone does not have the billions of dollars needed to rebuild and maintain economically depressed areas within the state in the absence of productive employment for their residents.

State government should use its power and resources to help create the conditions necessary for enterprise development and job creation. Specifically, the role of state government is to guide private sector investment, to overcome investment barriers, and to undertake workforce development.

The Commonwealth also has an important role, working in concert with municipalities and the federal government, in strengthening and rebuilding the public infrastructure within urban neighborhoods. This public investment should be targeted at not only improving the quality of life, but at creating opportunities for private investment in housing, commercial facilities, and industry.

While this *Strategy* cannot solve all the problems of people living in the inner city, it offers opportunities to rebuild areas in distress and, in so doing, to create the jobs that are desperately needed.

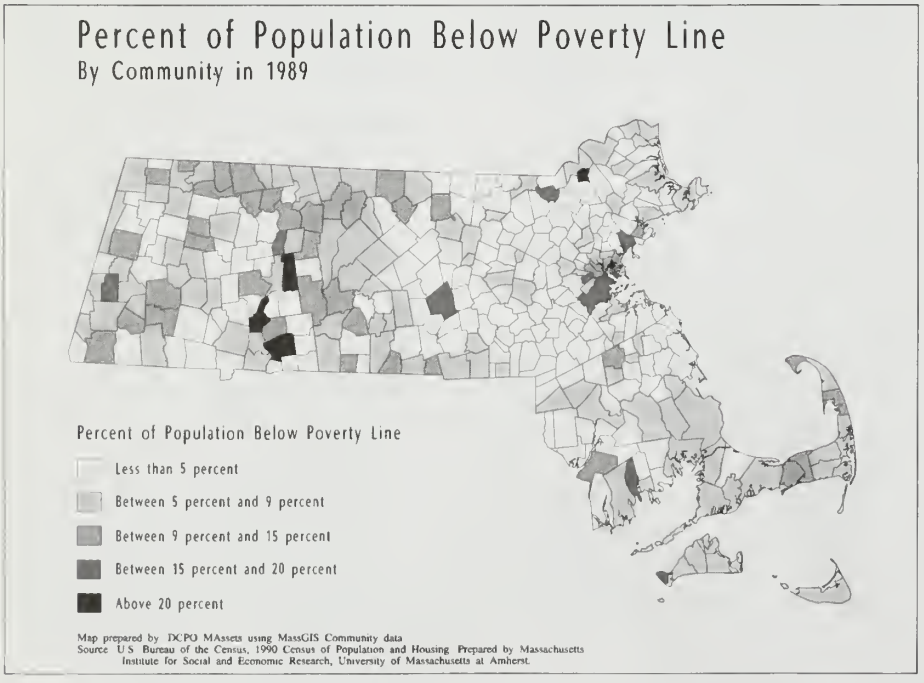

Percent of Population Below Poverty Line
By Community in 1989
Percent of Population Below Poverty Line
Less than 5 percent
Between 5 percent and 9 percent
Between 9 percent and 15 percent
Between 15 percent and 20 percent
Above 20 percent
Map prepared by DCPO MAssets using MassGIS Community data
Source U.S. Bureau of the Census, 1990 Census of Population and Housing. Prepared by Massachusetts Institute for Social and Economic Research, University of Massachusetts at Amherst.

Figure 7B

Capital Spending in Support of Urban Revitalization

Public investment in improved transit and roadway systems is an important component of an urban strategy. This investment can improve access to jobs for local residents, and allow for economic growth in areas which are currently constrained by overburdened inner city road networks. Nearly all of the Commonwealth's cities are benefitting from important transportation improvements, strengthening their roles as centers of economic and cultural activity.

The Commonwealth also is pursuing a number of important transportation and building projects that will have a direct impact on job creation and the quality of life in urban neighborhoods. Examples include:

- Creating a new Department of Revenue data facility in Chelsea, bringing 1,200 jobs to the city.

- Awarding $8 million per year in Low Income Housing Tax Credits to development and rehabilitation projects designed to increase the supply of housing for persons of low income and special needs in Boston, Cambridge, Springfield, and Worcester.
- Pursuing the Route 146 project and commuter rail extension to Worcester, and reconstructing bridges and streets in Lowell, Springfield, Brockton and other cities.
- Building a $17 million indoor track and field facility close to Roxbury Community College. This facility will be used by local high schools, nearby universities and colleges, and communities surrounding Boston.
- Helping build a multi-level parking garage to attract future office and hotel facilities at Ruggles Center. Additional parking will augment Ruggles Center's role as a transportation hub for the Corridor, maximizing use of the MBTA rapid transit and commuter rail facilities at Ruggles Station.
- Developing the 200-acre parcel of land located at the former Boston State Hospital grounds. The State will join together with community groups, the City of Boston and elected officials to accelerate the timetable for maximizing economic opportunities at this site.
- A $27 million expansion of the Worcester Centrum is planned to include a new 164,000 square foot convention facility. Governor Weld has pledged to seek legislative approval for a $12 million State contribution.

Reducing the Costs of Inner-City Business Development

Growing companies may be willing to locate in the inner city if provided with the right incentives and if they can find suitable facilities, in safe locations with good transportation access and a well-trained labor force.

The Weld-Cellucci Administration's plan to create Economic Opportunity Areas (EOAs) would provide state and local tax relief and other incentives to businesses locating within designated sections of distressed communities. These incentives include a 5 percent Investment Tax Credit, and an amount equal to 10 percent of the cost of renovating any previously underutilized or abandoned building.

In addition to tax incentives, both state and local agencies will work on coordinating and expediting permitting for businesses locating in urban neighborhoods. The proposed EOA act authorizes Commonwealth agencies to provide one-stop approvals in EOAs.

Growing companies may be willing to locate in the inner city if provided with the right incentives and if they can find suitable facilities, in safe locations with good transportation access and a well-trained labor force.

The Massachusetts Department of Environmental Protection also is developing new regulations regarding hazardous waste cleanup, applicable to many older industrial sites. Key changes include licensing professionals to oversee the clean up process, new private cost recovery procedures, and limited protection from liability for lenders and fiduciaries. Proposed regulations will establish clear reporting thresholds, below which it will not be necessary to report the site. Required cleanup levels will take into consideration whether the property is in a residential or industrial area or in an area served by public water and sewer service, thus helping make it easier to reuse urban sites while continuing to fully protect public health.

Building Community Self-Sufficiency: Small Business Creation and Expansion

There is a shortage of local businesses in minority communities. Residents often have to travel outside the community in order to go to the supermarket, the drugstore, or the bank. This is not only inconvenient, it is also damaging to the economic health of the community, as money earned or received by residents does not stay in the community and increase local wealth. An important solution to this problem is to help community residents start their own businesses. This not only provides employment within the community, but also develops skills that can be applied to jobs in the wider metropolitan economy.

Low income city residents need both access to capital and technical assistance in order to turn their ideas into viable sources of employment. The Commonwealth is encouraging Community Development Corporations (CDCs) to expand their areas of activity from the development of affordable housing and the provision of social services, to the promotion of economic development in their neighborhoods. The Executive Office of Communities and Development's (EOCD) CEED program awards CDCs money for programs that link economic development with social services such as job training. EOCD also is starting a Microenterprise Development Program to provide technical assistance and make loans of up to $5,000 to business candidates sponsored by community-based organizations.

The Community Development Finance Corporation (CDFC) has a number of programs focusing on job creation and the long-term viability of businesses in urban communities:

- a *Venture Capital Fund* provides debt and/or equity financing to small businesses sponsored by CDCs.
- a *Small Business Loan Guarantee* Program broadens the availability of commercial credit to microenterprises located in CDC-targeted areas.

- the *Commonwealth Enterprise Fund,* a specialized Small Business Investment Company owned by the Massachusetts Minority Enterprise Investment Corporation, will provide equity and debt capital and technical assistance for minority and disadvantaged businesses in the Commonwealth.
- a new *Urban Initiative Fund* will build the capacity of small minority-owned businesses and minority-controlled community organizations.

Empowering Urban Residents to Access Job Opportunities: Education and Training

Like all citizens of Massachusetts, urban residents must have high-quality education and lifelong job training if they hope to be part of a productive modern economy. At the same time, companies locating in the inner city must be assured of access to a skilled workforce. The Commonwealth's K-12 education reform efforts would guarantee adequate funding for the school systems of even our poorest communities, and would reform standards, curricula, and teacher tenure and training.

Vocational training must also be reformed, building partly upon successful apprenticeship models such as Boston's Project Protech, where students mix skilled jobs as health technicians with appropriate high school and college classes.

Training must continue throughout life. The MassJobs Council is working to create a more effective workforce development system that provides training which more fully addresses the needs of current industries. The Council, in conjunction with the Department of Employment and Training, the Bay State Skills Corporation and individual training providers, will continue to work with employers to develop appropriate skills training.

Building Stable Neighborhoods: Helping Urban Residents Obtain Affordable Housing

The Commonwealth has long supported affordable housing development and rent subsidies serving poor urban populations. The emphasis today is on stabilizing neighborhoods by providing homeownership opportunities to low income families. Programs implemented by EOCD provide opportunities for first time low income homebuyers. The Massachusetts Housing Finance Agency (MHFA) has developed programs to restore surplus or abandoned properties to the real estate rolls by providing opportunities for low income families to purchase and renovate them.

Like all citizens of Massachusetts, urban residents must have high-quality education and lifelong job training if they hope to be part of a productive modern economy. At the same time, companies locating in the inner city must be assured of access to a skilled workforce.

Some of these programs are first in the nation models of how to turn existing housing stock into decent, affordable homes for low and moderate income first time homebuyers. They include such features as discounted prices, low interest rates and down payments, help with the cost of rehabilitation and lead paint removal, and homebuyer counseling services.

Building Entrepreneurial Capacity: Provide Special Assistance to Minority-Owned Enterprises.

In recognition of the historic barriers that have faced minorities in the business world, the State has made efforts to assist minority-owned firms. As can be seen in Figure 7C, per capita income for the state's minority populations falls far below that for whites.

State Procurement. The Commonwealth is the largest single employer in Massachusetts, and spends billions of dollars annually on construction contracts, materials, consultants and other private services. Executive Order 237 requires State agencies to purchase 5 percent of goods, 5 percent of services and 10 percent of construction contracts from minority business enterprises (MBEs). This program has been effective in directing millions of dollars in contracts to minority businesses. However, it has some shortcomings which can be addressed:

- Increasing the percentage of state business conducted with minority enterprises must be a higher priority for all secretariats, agencies and departments. Failure to comply with Executive Order 237 will have penalties attached.
- Executive Order 237 should become law and purchasing requirements should be raised. A new purchasing requirement for women's business enterprises should be established which is separate from, and in addition to, the state's minority business purchasing requirements.
- The responsibilities of the State Office of Minority and Women's Business Assistance (SOMWBA) should be expanded to make the agency a one-stop, user-friendly shop for all minority/women's business issues.

Mentoring. The Administration is exploring the creation of a Massachusetts Mentoring Pilot Program. This program would link large, established majority (mentor) businesses with small and economically viable minority (protege) businesses in a mutually beneficial relationship, negotiated and agreed upon by both parties. Mentors would provide proteges with support services in areas such as financing, management, technical and product/services development, contracts, and marketing. The pilot program's goals are to generate jobs in minority communities, promote the competitiveness of minority firms, and expand the economic base of inner-city neighborhoods.

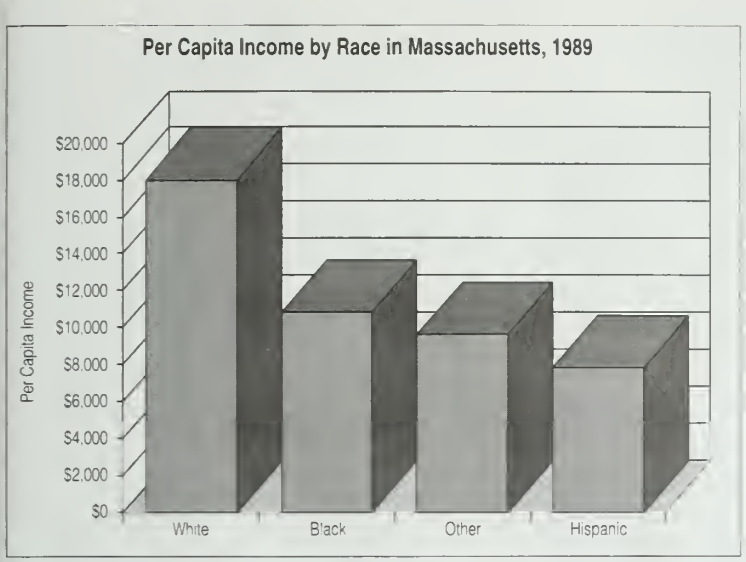


Figure 7C

ISSUE NUMBER TWO: ENCOURAGING RURAL AND SMALL CITY DEVELOPMENT

DEFINING THE ISSUE

The Massachusetts economic boom of the 1980s passed over a great many rural towns and small cities. Few of these communities experienced the high levels of wage growth, employment gain and income improvement seen in the state's major metropolitan areas. Relative to suburban communities in particular, rural and small city incomes have performed poorly and unemployment has run consistently higher. The recent recession has been particularly hard for Massachusetts' rural towns and small cities and has left them in a potentially critical situation. In October 1992, the state's non-urban areas recorded an average unemployment rate of 10.7 percent, dramatically higher than the 7.6 percent figure for the state as a whole. To make matters worse, the prospects for a strong recovery in rural towns and small cities are far less promising than those for urban areas. As can be seen in Figure 7B, many rural towns have a large percentage of their population falling below the poverty line.

While the state's medium-size and large cities and their metropolitan areas contain most of its economy and population, the growth of smaller cities and rural towns across the Commonwealth is also vital to the state's economic future. The distinctive characteristics and needs of non-urban areas must be acknowledged and addressed if they are to remain viable participants in the state's economic recovery.

Reliance on Traditional Manufacturing

The primary explanation for the difficulties faced by small cities and rural areas lies in the statewide structural shift away from the production of manufactured goods towards services. Rural areas and small cities are more dependent upon manufacturing than metropolitan areas and have therefore been particularly hard hit by the shift. Athol, Gardner, Southbridge and Ware, for example, all have manufacturing sectors which exceeded 30 percent of total employment in 1991. The statewide average distribution of employment in the manufacturing sector for the same period was only 17.6 percent.

The growth of smaller cities and rural towns across the Commonwealth is vital to the state's economic future. The distinctive characteristics and needs of non-urban areas must be acknowledged and addressed if they are to remain visible participants in the state's economic recovery.

The effect of the decline in manufacturing has been compounded by the fact that traditional manufacturing industries have performed particularly poorly over the past few years. Unlike the state's major metropolitan areas, few rural towns or small cities have new manufacturing industries with high growth potential that could replace lost employment—much less create long term job growth. Service jobs have meanwhile failed to show the same propensity for replacing the eroding manufacturing base seen in many metropolitan areas.

Economic Impediments

Rural and small city communities experience a host of economic impediments to which metropolitan areas are not subject:

- Non-metropolitan areas are, for example, at a considerable disadvantage with respect to transportation costs. Their distance from the state's major business centers is exacerbated by below average road, rail and air transport infrastructure systems. Rural towns and small city areas also lack the educational, financial, and technical resources to which the Commonwealth's large urban areas have access.
- Rural and small cities are furthermore faced with the problem of out-migration and the growing fear that their long-term economic viability is slowly being eroded.

Limited Development Capabilities

The ability of rural town and small city government to take active and effective steps to solve their problems and foster economic development is unfortunately quite limited. The employment base that rural towns and small cities depend on is often not located inside the community. As a result, many small towns have little influence over the decisions of dispersed and distant employers to expand or contract employment. The effectiveness of economic development in rural towns and small cities is also constrained by the limited administrative capabilities of local government. Small town government is generally characterized by volunteer

boards and town meeting decision-making. As a result, information about state economic development initiatives may never be heard, or may be difficult to access due to limited professional staffs at the municipal level. Small towns also have difficulty responding to requests and proposals from prospective employers, who may end up locating in a larger community where full-time staff were available to address their needs.

THE ROLE OF THE COMMONWEALTH

A Framework for Action

In formulating its overall development strategy, the Commonwealth must ensure that future economic growth extends to rural areas and small cities. This will entail pursuing an economic strategy which does *not* depend exclusively upon promoting prominent high-growth industries such as information, biomedical, and environmental technology, which tend to concentrate near major research centers.

- In the Berkshires and the Northern Tier of the Pioneer Valley and Central Regions, for example, it is the plastics, paper products, and paper machinery industries which appear to hold greatest growth potential.
- Tourism and craft production are other important business sectors in non-urban areas which must be promoted.
- Delftree Corporation's success producing Shitake mushrooms in North Adams has demonstrated that there is potential for specialized high-margin agricultural production in rural areas.

To help guide this effort, the State has brought together regional business leaders, policy-makers and community representatives to discuss issues such as growth, quality of life, land use and infrastructure needs in a regional, not just state, context. This process has highlighted a number of significant development issues where the State can help to create an environment conducive to economic development in rural towns and small cities.

The Massachusetts Rural Development Council

In late 1992, Governor Weld formally launched the Massachusetts Rural Development Council which will serve as the long-needed focus for rural development efforts in Massachusetts. The Council's priorities will be to highlight rural development issues for the state as a whole, improve communication among all rural development actors, and to remove the barriers to effective and efficient action. Central to this effort will be an assessment of the economic, social and environmental development needs of the Commonwealth's rural areas and an inventory of available development resources. The Council will analyze the economic strengths and weaknesses of the Commonwealth's rural communities and evaluate their long-term obstacles and opportunities for economic growth. This comprehensive analysis will form the basis for establishing a strategic, focused plan of action for tackling the state's rural development problems. The Council will draw support from the Center for Rural Massachusetts at the University of Massachusetts at Amherst, which will conduct applied research on special rural issues in Massachusetts and serve as an information clearinghouse for town and state officials who deal with these issues.

Many of the policies and initiatives described elsewhere in this strategy were developed in a manner that ensures they are relevant to the needs of rural businesses and communities.

APPLYING ELEMENTS OF THE *STRATEGY* TO RURAL AND SMALL CITY DEVELOPMENT

Many of the policies and initiatives described elsewhere in this strategy were developed in a manner that ensures they are relevant to the needs of rural businesses and communities. The following is a brief assessment of several problems facing rural and small city communities and businesses and strategies to address them.

Investment

Although the state as a whole has been experiencing a credit and capital crunch over the last few years, rural towns and small cities, due to their isolation from financial centers, have been particularly hard hit. Exacerbating the general problem has been the takeover of some local banks by large regional banks, with a loss of the personal relationships and local focus that the former banks maintained. The Commonwealth's non-urban areas also have an unusually high concentration of small firms, which are having particular trouble obtaining financing.

Several proposed capital and credit initiatives can be targeted to ease the credit crunch being experienced in rural areas: the Small Business Capital Access Program would help stimulate loans to rural and small city businesses; part of the state's proposed Early Stage Equity program could be explicitly targeted toward rural and small city areas; and the creation of Economic Opportunity Areas would bring a package of tax and regulatory incentives of considerable benefit to businesses in distressed rural and small city areas.

Assisting the Process of Structural Adjustment through Training

The combination of a heavy dependence upon declining industries, limited economic diversity and distance from major labor markets makes it especially important that rural towns and small cities have programs which can adjust workforce skills to meet local industry needs. There are currently large pools of displaced workers with little chance of being rehired unless they develop new skills. Training is also crucial because many of the most successful employers in non-urban areas depend upon niche markets and sophisticated production processes which allow them to compete with larger and more advantageously located rivals.

The Commonwealth is currently in the process of redeveloping its worker training system. The state's 16 Regional Employment Boards (REBs) have identified the training requirements of key and emerging industries within their respective regions. Efforts will be made to target training services to the needs of critical industries on a regional basis. This will be of particular importance to rural towns and small cities whose needs may have been overshadowed by the needs of urban areas in earlier workforce training strategies. The state's reforms will give rural small city communities and employers more attention and greater input into the design and execution of workforce training programs.

Technology Transfer and "Know-How"

The small size and locational disadvantages of rural and small city businesses make it important that they stay abreast of new methods and processes to stay competitive with urban firms. Unfortunately, the lack of universities with technical graduate programs and research laboratories in rural and small city areas makes this process more difficult than it is in the state's urban centers. Coordinated state, business, and university action must be undertaken to compensate for this shortcoming. This action could take the form of technology partnerships established to help form links between Massachusetts companies, universities, and non-profit laboratories. An Industrial Extension Service would focus resources on helping small and medium-sized manufacturers, such as those often found in rural towns and small cities, to modernize their management and production process.

Promoting Exports

The internationalization of most markets has made the promotion of exports increasingly important to economic growth and competitiveness. Rural and small city industries such as crafts, paper products and machinery have the potential to make significant inroads into foreign markets if exports are aggressively pursued.

The Massachusetts Office of International Trade and Investment (MOITI) should make a particular effort to help rural businesses with its programs, services and institutional functions that support and facilitate foreign market expansion. The Small Business Development Center, the Export Finance Program, and marketing could also have a significant impact upon rural and small city export performance.

Attending trade shows and participating in trade missions can be successful means for a business to expand its market beyond its local and regional confines. This is particularly true for industries located in non-urban areas which are often remote and inaccessible to extra-regional customers. MOITI should enlist participation of rural and small city businesses in trade missions, and should make a special effort to reach non-urban companies when organizing group and state sponsored booths at trade fairs.

The State's effort to establish regional "one-stop shopping" offices for permit, finance, technical and information assistance should have a substantial impact upon business in Massachusett's non-urban areas.

Regulatory Reform

Many small cities and towns have vacant mill buildings or former gas stations which could be used to house new businesses. Unfortunately, there is hazardous waste contamination at many of these sites and liability issues and the uncertainty of clean-up costs makes it very difficult to sell or rehabilitate old, vacant industrial buildings that are otherwise structurally sound. The current recession removes what little incentive there might have been during boom times to reuse these buildings, which are a blight on communities and a potential danger, since many owners do little to maintain them. One unintended effect of the hazardous waste clean-up stipulation is that it discourages development within rural town and small city centers. Rather than redeveloping an existing site, prospective businesses find it easier to locate on forest or farmland parcels.

- Recent amendments to the state superfund statute address some of those difficulties by providing lenders with some protection from liability and providing greater flexibility in hazardous waste clean-up requirements. The State should ensure that these changes are brought to the attention of companies that are in the process of establishing new facilities.
- Further improvement could be generated by the Governor's proposed EOA legislation, which includes a provision to allow a 10 percent tax deduction for companies developing vacant or abandoned buildings in economically distressed areas.
- Proposed legislation to protect the Commonwealth's rivers and streams should be carefully structured to enable the redevelopment of old mill buildings while protecting the quality of the rivers and streams located nearby.

Rationalization of Business Assistance

The Commonwealth's patchwork of programs and resources can be confusing to even economic development professionals. The problem is particularly acute in non-urban areas of the state because, unlike larger city governments, towns rarely have professional staff with the time to learn about the many and often-changing programs offered by the State, its educational institutions, and its quasi-public corporations.

The Commonwealth's effort to establish regional "one-stop shopping" offices for permit, finance, technical, and information

assistance should have a substantial impact upon business in Massachusetts' non-urban areas. Rural and small city areas tend to be located furthest away from Boston and are therefore at the greatest disadvantage under the current centralized system. In addition to its logistical advantages, a regional delivery system will more easily accommodate special rural and small city business needs.

Improving the Capacity of Rural Town and Small City Economic Development

The Executive Office of Communities and Development provides support for, and improves the capacity of, rural and small government management through its Municipal Incentive Grants and Strategic Planning Grants. These grants promote efficient and effective practices such as regional delivery, privatization, automation and consolidation. The town of Amherst, for example, received a $20,000 grant from the Municipal Incentive Grant Program to develop an automated permit tracking system for six of its government departments.

The Circuit Rider Program is another state initiative funded out of EOCD, that allows two or three communities to share a professional staff person. It has worked well in the past, but state funding has been cut in recent years and many communities have been unable to sustain their share of the administrator's salary. Restoring funding to this small program would go a long way toward helping rural communities with their economic development needs.

Promoting Tourism

The Cape, the Islands and the Berkshires all have well-developed tourist industries which are vital to their economic life. It is important that these and other rural areas are marketed nationally and internationally. Increasing the quality of promotional materials to foreign markets is seen as important to sustaining and strengthening the tourist industry. To help pursue this goal the Commonwealth is developing a Massachusetts Heritage Discovery Network to collectively market the State's natural, cultural, historic and recreational tourist resources.

The Commonwealth can also bring its resources to bear on specific tourism-related projects proposed for rural and small city areas:

- The recent decision to place the National Music Center in Lenox was due in part to the Commonwealth's offer of financial, regulatory, infrastructure, and training support.
- The Commonwealth established a Tourism Fund, in part, to assist projects throughout the state. Several of the initial grants have gone to rural areas, such as a $50,000 grant to the Norman Rockwell museum in Stockbridge, a $73,000 grant to the Woods Hole Oceanographic Institution for a new tourist attraction, a $150,000 grant to Tanglewood, and a $25,000 grant to the Town of Sandwich.

Structural changes within the defense industry will continue to have a significant impact on Massachusetts employment, particularly in the manufacturing sector.

Another means through which the Commonwealth could help maximize the potential of the tourist industry is through relevant infrastructure investments:

- Compared to neighboring states such as New Hampshire, Massachusetts has a conspicuous lack of rest areas, amenities, and tourist information stations along major traffic routes to and from tourist areas. To meet this pressing need, the State is designing a prototype for "Welcome to Massachusetts" Tourist Information Centers.
- The 1991 Surface Transportation Act can also have a positive impact on Massachusetts' rural and small city communities and areas by targeting Scenic Byways development and transportation enhancement funding set-asides.

ISSUE NUMBER THREE: DEFENSE RESTRUCTURING

DEFINING THE ISSUE: THE SIZE OF MASSACHUSETTS' DEFENSE INDUSTRY

The size and scope of the defense industry in Massachusetts, as well as the serious nature of challenges facing the industry at the present time, indicate the need for a strategic response from state government. This section outlines the current situation and illustrates how several of the policies and programs described in preceding sections can be applied to defense diversification efforts.

The defense industry today represents the Commonwealth's largest source of manufacturing employment, encompassing several sectors from transportation to communications. According to an estimate by the Defense Budget Project, Massachusetts' 1991 employment in the defense industry was approximately 140,000 people, or nearly 5 percent of the total employed workforce. This included people employed in manufacturing and service firms and in defense-funded research and development centers. An additional 18,000 military employees brought the total to 158,000. As can be seen in Figure 7D, Massachusetts led the nation in the dollar value of defense contracts per capita in 1990.

The Massachusetts defense industry is dominated by five major contractors, which account for 80 percent of total prime contract awards. These companies are Raytheon, General Electric, GTE, MIT and the MITRE Corporation. Raytheon, MIT and MITRE were leaders in R&D funding in FY 1991, while Raytheon, GE and GTE were leaders in manufactured products. The dis-

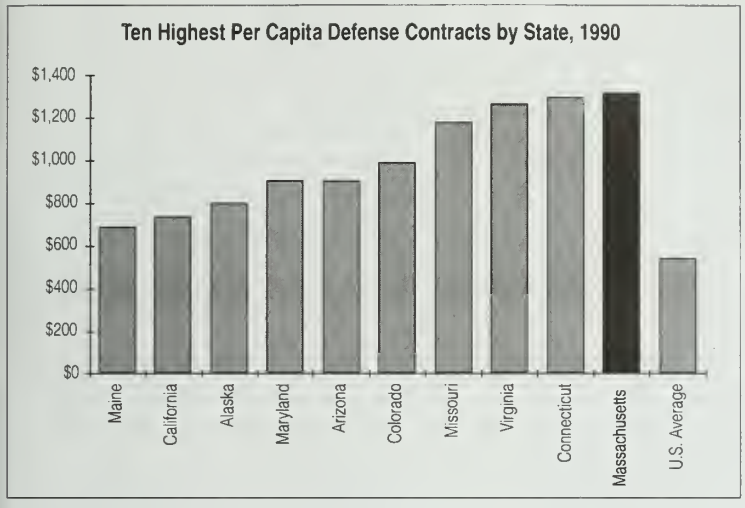


Figure 7D

tribution of the $6.9 billion in Department of Defense (DoD) hardware purchases in Massachusetts in FY 1991 was weighted towards missiles and components ($2.4 billion), electronics and communications systems ($1.2 billion), and aircraft engines and components ($1 billion). Another $1 billion went towards research and other services. The common denominators of these contracts are complex systems engineering, electronic systems design, engineering and integration, and precision manufacturing of electronic and mechanical assemblies. These capabilities will continue to be important to the DoD. The know-how required to fulfill these contracts can also be applied to complex, non-military problems.

In addition to the relatively few prime contractors, there are many small and medium-size companies throughout the state that form a manufacturing supply and service sector base. This group of subcontractors and vendors can be divided into two different types of companies: at one end are companies supplying specialized subsystems that are integrated into major defense systems, and at the other end are the food, cleaning services and suppliers of consumable and office products. Major subcontractors of the first type include Wyman-Gordon in North Grafton, Ametek Aerospace Products in Wilmington, Palmer Manufacturing in Malden, M/A Com in Burlington, and Advanced Manufacturing Company in Westfield, among many others. In addition, there are sizeable clusters of small subcontractors located in the northeast, central and western parts of the state specializing in fabricated metal parts and subassemblies for prime contractors located in both Massachusetts and Connecticut.

The Problem: Managing Employment Losses

The DoD budget, in constant dollar terms, has been declining since Fiscal Year 1985. Between FY 1985 and FY 1992, nationwide defense funding fell 24 percent. Prime contract awards to Massachusetts firms have declined sharply over recent years, from $8.75 billion in FY 1989, to $6.9 billion in FY 1991. An estimated 26,000 jobs were lost in the Massachusetts defense industry from FY 1988 to FY 1992.

Structural changes within the defense industry will continue to have a significant impact on Massachusetts employment, particularly in the manufacturing sector. With contract awards expected to continue declining, the Defense Budget Project has estimated a loss of 44,000 direct defense jobs at Massachusetts contractors from the FY 1993 through FY 1997 period, with the steepest loss in FY 1993. Indirect job losses (i.e., in businesses that serve defense-dependent workers and communities) are expected to exceed 50,000. Meanwhile, the closing of Fort Devens in 1995 will add job losses of 6,800, for an estimated total of over 100,000 jobs eliminated from the economy between 1992 and 1997.

Massachusetts' defense firms tend to be concentrated geographically, with certain communities especially vulnerable to a defense spending downturn. In the Berkshire Region, GE Aerospace reduced its workforce by approximately 1,200 people between 1988 and 1991. In the Northeast and Greater Boston Regions, one of the largest employers is Raytheon, which laid off approximately 1,500 people in 1992 alone.

As prime contractors lose business, the many small subcontractors that serve them also lose business and have to reduce their workforces. The prime contractors also are consolidating their supplier bases and pulling work "in house" when they can, which reduces employment opportunities for subcontractors still further. These are the conditions that have led to shrinking business and employment at metalworking and other supplier firms in the Greater Boston, Northeast and Central regions, as well as firms in the Pioneer Valley which serve divisions of United Technology across the border in Connecticut. Thus, large layoffs and dislocation pose an on-going risk in virtually every part of the state.

Working Together To Face The Challenge

One of the immediate steps Massachusetts must take is to make sure its defense-dependent economy is not damaged further from even more rapid reductions in federal defense spending, and by the loss of remaining defense contracts:

- The Defense Department's plans to fund continued upgrading of defense systems and development of new technologies for limited production and dual military and commercial use should be supported by the state's congressional delegation. This is critical to maintaining the research and development capabilities of Massachusetts contractors. Retaining a strong R&D program, coupled with prototype production, will maintain the state's ability to create, build and remain the leader in highly complex defense systems. These systems also may have important commercial applications.
- As the competition for shrinking defense contracts becomes tougher, Massachusetts

firms must not be hobbled by high business costs such as unemployment insurance, health care and workers compensation. The Commonwealth's efforts to lower these costs will help defense firms remain competitive with rivals in other states.

Even with the above efforts, it is inevitable that domestic demand for defense technology will experience steep decline. The driving force in achieving a transition towards a less defense-dependent economy will be the ability of the private sector to establish new products, companies and markets that can use the advanced technology and skilled workforce developed for military markets. The possibilities that defense-dependent firms can pursue include:

- Increasing exports and marketing efforts for existing products to non-DoD prospects.
- Creating new products for commercial markets, based on technology and expertise developed for military markets.
- Carrying out research and development of technologies that have a "dual use" for both military and commercial applications.
- Moving into new lines of business via joint ventures or strategic acquisitions.
- Transferring technology and skilled human resources to other new or existing firms that can use them to create commercial products.

In normal circumstances, a replacement economy could emerge without any public involvement, through the processes of the private market. But the speed and magnitude of the defense build-down, coupled with the necessity of carrying out extensive research, retraining and retooling before shifting to commercial production, requires government to take a strong role in the transition. Failure to act will result in massive layoffs and place severe pressure on state and local government in accommodating increased demand for social services, under the burden of a shrinking tax base.

The federal government bears primary responsibility for addressing the effects of its reduced defense spending. The Defense Conversion Reinvestment and Transition Assistance Act of 1992 allocates over $1.5 billion to a variety of defense conversion efforts nationwide. The Act provides: $694 million for defense industry and technology base programs to invent, develop, apply and commercialize new technologies, with specific help to small businesses; $686 million in support of programs to retrain military personnel and displaced defense workers; and $132 million in expanded and improved programs to help states and communities implement defense economic adjustment and diversification plans. The Commonwealth must ensure that

The driving force in achieving a transition towards a less defense-dependent economy will be the ability of the private sector to establish new products, companies and markets that can use the advanced technology and skilled workforce developed for military markets.

Massachusetts receives its fair share of these funds, and must coordinate the expenditures with state efforts.

THE ROLE OF THE COMMONWEALTH

The Commonwealth's primary role in addressing the defense problem is that of *coordinator*—channeling state and federal resources to help firms proceed with the strategies that best suit them. The allocation of funds should be market-driven, with shared risks and responsibilities between the public and private sectors.

For the past year, the Commonwealth has been addressing defense issues in several ways. It has examined the impacts of defense cuts and developed diversification strategies in concert with the Task Force on Defense Industry and Technology, a subcommittee of the Governor's Council on Economic Growth and Technology that includes representatives from the state's largest contractors. Meanwhile, the Industrial Services Program (ISP) has undertaken a Defense Diversification Project to identify potential job loss among subcontractors in Massachusetts caused by cuts in defense spending, and to create an adjustment strategy suited to these smaller firm's needs.

- ISP is offering retraining programs for defense workers who have been laid off. ISP also is providing technical assistance including regional workshops for subcontractors, business demonstration projects which will allow participating companies to contract with an outside expert to perform basic work in diversification preparation, and community-based adjustment strategies.
- The Massachusetts Government Land Bank is currently investigating alternative uses for Fort Devens in preparation for its closure in 1995. In July, 1992, the Weld-Cellucci Administration announced the creation of a new intermodal facility at Fort Devens, which will allow direct cross-continent rail transportation from the port of Boston.
- In conjunction with the Governor's Council Task Force on Defense Industry and Technology, the Commonwealth is exploring ways to shift defense research, technology and skilled labor into such emerging fields as educational, transportation, and environmental technology.

To pull these diverse efforts together, the Commonwealth should establish an office of defense diversification coordination to serve the following functions:

- Develop a clear and comprehensive defense restructuring strategy building on the analytic base provided in this *Strategy.*
- Act as coordinator for receiving and distributing federal money, providing local

companies and communities with information on diversification programs and resources, and ensuring that funds are utilized to maximum effect.

- Establish early warning systems to identify firms needing assistance, and provide information to firms on successful diversification efforts.
- Serve as a broker linking firms and communities with sources of financial, training and technical assistance.
- Serve as a member of technology partnerships that are created between the State, businesses, and the research community to facilitate technology development and transfer.
- Ensure that the needs of small and medium-size companies, as well as the concerns of all regions of the state are adequately met by diversification efforts.

APPLYING ELEMENTS OF THE *STRATEGY* TO DEFENSE RESTRUCTURING

Investment. Massachusetts defense firms will need to invest in new, highly productive plant and equipment to make new products and rework older product lines for new commercial uses. Investment incentives can address these needs, in the form of an investment tax credit, loan guarantees and subordinated debt financing for advanced manufacturing facilities, and a Small Business Capital Access Program to help provide working capital.

The Industrial Services Program also recently started a $2.7 million Revolving Loan Fund, using a combination of federal and state dollars, to provide working capital and equipment loans to manufacturers impacted by defense spending reductions. The loans will require and make available business consulting services.

Much of the success of defense diversification will be in the creation of new businesses that apply the technology and skilled workforce of the defense sector to commercial markets. The Commonwealth can help create these businesses through an Early Stage Equity Program that addresses the unmet capital needs of start-up ventures. The Commonwealth should also pursue regulatory reform which would make it quicker and easier to start a new business.

Training. Retraining defense industry workers is crucial to alleviating defense-related unemployment. Training that is offered to defense workers must be geared towards transferring their existing skill base to industries with growth potential. The Commonwealth should work with the federal government to ensure that new federal training funds associated with defense conversion not be so restricted as to prevent their effective use in assisting industries in transition. Restrictions attached to present, non defense-related training dollars are so severe they are of little use in this context.

The Commonwealth should establish an office of defense diversification coordination that will develop a clear and comprehensive defense restructuring strategy building on the analytic base provided in this *Strategy*.

Through the MassJobs Council, the Commonwealth currently is working to create a workforce development system which will create a dialogue between specific industries and providers of training services. Small defense subcontractors could join together in networks to identify their most critical training needs. This knowledge would be used by training service providers to develop curricula that would directly address these needs.

Know-How. Prime contractors are in the process of consolidating their supplier base. In order to be among the survivors, and to improve their competitive positions, subcontractors need to improve their productivity and quality control. An Industrial Extension Service (described in more detail in Chapter 5) could focus state resources such as university expertise and training capacity to help small and medium-size firms modernize. Its principal roles would be those of catalyst and broker, identifying and disseminating knowledge through industry networks. The needs of small and medium-sized defense companies attempting to enter commercial markets are distinctive in that they go beyond typical issues of manufacturing and management best practices to encompass basic problems of strategic planning, product development, and marketing.

Technology Transfer. The research and development area is one part of the defense industry where funding is less likely to be cut. It is also an area where the Commonwealth has a decided competitive advantage due to its strong base of science and technology resources. State government must be at the cutting edge of technology

Massachusetts' defense industry is the state's largest manufacturing sector, but it faces sharply reduced demand from its primary customer. The industry is pursuing new markets and and new opportunities for diversification.

Photo courtesy of Raytheon

transfer and commercialization. It can accomplish this in several ways:

- The Commonwealth is working with federally-funded research centers and technology transfer organizations, such as the NASA-funded Center for Technology Commercialization in Westborough, to create opportunities for market-oriented transfer of technology from the nationwide federal R&D base.
- The State Division of Energy Resources and the Federal Department of Energy are actively pursuing the transfer of technology from the defense industry to the energy industry.
- The Commonwealth can assist in the development of one or more partnerships among and between private firms, public and private educational institutions, and research centers to develop "dual-use" technologies with both military and commercial applications.
- The University of Massachusetts system can reach out to defense subcontractors, particularly in the Pioneer Valley and Northeast Regions, to explore possibilities for joint research and technology transfer appropriate to the capabilities of these firms.

Exports. Defense equipment designed and manufactured in Massachusetts was highly effective in Desert Storm, and many of our allies look first to U.S. suppliers for equipment. International sales of both military and civilian systems offer a viable near-term opportunity to boost local companies' production and employment. The Commonwealth can help by providing loan guarantees for export financing, and promoting the products of local companies through trade missions and the activities of the Massachusetts Office of International Trade and Investment.

ISSUE NUMBER FOUR: ENCOURAGING THE CREATION AND GROWTH OF NEW AND SMALL BUSINESSES

DEFINING THE ISSUE: THE NEED FOR NEW AND SMALL BUSINESS VITALITY

Entrepreneurship, as expressed in the form of new and small business activity, is widely regarded as a crucial component of economic growth and vitality. New business creation and the growth of existing small businesses together are estimated to produce more than 80 percent of all employment growth. Figure 7E illustrates that more than two-thirds of the jobs added during Massachusetts' last period of growth were in new business "births" alone. New and small business activity also provides the economy with renewal and innovation—the most important sources of long-term competitiveness.

The Massachusetts economy is particularly dependent upon new and small businesses as a source of employment growth. The structural nature of many of the job losses over the last four years means that most laid-off workers are not likely to be rehired by their old firms even with a recovery. Indeed, many large employers will continue to shed jobs as they readjust their production processes to remain competitive in the face of a tougher national and international business environment. New and small business growth is, therefore, a crucial source of new employment for the state's large pool of unemployed workers.

Despite the importance of new and small business growth to the success of the Massachusetts economy, recent entrepreneurial performance has been relatively poor. In the period between October 1990 and September 1991, Massachusetts had the seventh lowest level of new business creation per 100,000 workers in the nation, with a 15 percent contraction in new business creation from that posted the previous year. Obviously, difficult economic conditions played a large part in this. If Massachusetts is to successfully set course for a high growth future this performance will have to be dramatically improved.

APPLYING ELEMENTS OF THE *STRATEGY* TO NEW AND SMALL BUSINESS CREATION

Investment

Investment, whether funded by equity or debt, is the crucial ingredient for small business growth.

For start-ups, equity is the only real answer, since a new firm lacks both the track record and assets on which to base a credit decision. Investors and entrepreneurs familiar with local equity markets indicate that the most significant gap in the availability of equity money today is for start-ups and companies in the earliest stages of growth. Several reasons are cited. The elimination of preferential federal tax treatment for capital gains in 1986

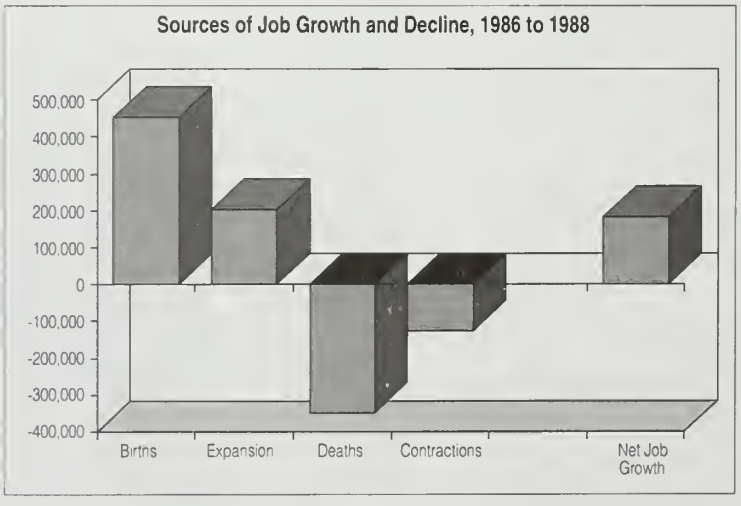


Figure 7E

made equity capital relatively more expensive and, therefore, made investors more risk-averse and short-term in their outlook, prejudicing start-ups and young companies. In addition, the credit crunch caused lenders to withdraw from much small business lending, forcing more established small businesses to turn to the equity markets. This has placed more of the burden of financing new companies on individual investors who, unlike pension funds and other institutional investors, are strongly affected by the capital gains tax.

The credit situation for small companies is also difficult. Small business loans carry high administrative costs relative to their return, causing many struggling banks to withdraw from small business lending. Further, many small businesses have been disproportionately affected by the two hammers of the credit crunch—the drop in real estate values and the tightening of lending standards. For many small businesses, the principal business asset which can serve as collateral for a bank loan is real estate. Even small business borrowers with sufficient income to pay off their loans currently—and with a clear track record of doing so—have seen their borrowing capacity drop or even disappear because of loss of value in their real estate assets and stiff new credit standards.

While no one should advocate forcing banks to make unwise loans, there is the possibility that the current situation represents something of an over-reaction. Banks and regulators may be assuming an ultra-conservative position towards credit risk that is no more justified by present circumstances than were some of the free-wheeling lending practices of the late 1980s. Further, cutting off the supply of credit to small businesses may reflect a self-fulling prophecy. Real estate values will likely remain depressed until real job growth returns to the economy. Impeding small business growth is one of the surest ways to delay net job creation.

Because of the importance of stimulating new private sector lending and equity investment in the near-term, Governor Weld filed with the legislature in the fall of 1992 a package of legislation regarding investment. The Governor's Jobs Package included measures designed to encourage equity investment—a phase-out in the rate of state taxation on long-term capital gains and a tripling of the investment tax credit—and measures designed to stimulate private lending—a small business capital access program, emerging technology fund, and export finance program. For a $50 million commitment of appropriated funds, an estimated $450 million in private lending could be leveraged. The two proposed tax measures would trigger millions of dollars more in new capital investment. These measures are discussed in greater detail in Action Category 10 in Chapter 5. As of this writing, the package of legislation is before the legislature awaiting final action.

Small businesses have been disproportionately affected by the two hammers of the credit crunch—the drop in real estate values and the tightening of lending standards.

An additional measure, not included in the Governor's original package, to address a new and small business needs would be an Early Stage Equity Program. Little or no state funding or backing would be required to establish such a program. State pension funds, applying strict fiduciary standards, may be able to leverage relatively small investments through the federal SBIC program into a significant source of new equity capital for new and growing companies. These funds could be coinvested with private funds to obtain further leveraging. State leadership, not state funding, is the critical requirement for the launching of such a program. This program also is further discussed in Action Category 10 in Chapter 5.

Regulatory Burdens and Business Costs

Addressing regulations that burden small business is and should remain a priority of Regulatory Reform and permit streamlining efforts.

New and small businesses are disproportionately affected by cumbersome regulations and high government-regulated business costs. Complying with the myriad requirements of both state and federal law governing the workplace is a heavy burden. Regulations governing specific types of businesses are layered on top of the general requirements. Small employers are the least able to cope with these requirements by purchasing outside legal assistance or dedicating an employee to the task.

Efforts to streamline regulations by reducing ten forms to one, or by eliminating requirements that serve no clear public purpose in the context of small employers, can have a particularly large benefit for new and small businesses.

The impact of government-regulated business costs is also particularly severe for small businesses. Workers' compensation, unemployment insurance, and health insurance costs have driven up the cost of each new hire and have discouraged job creation. Small companies find it particularly difficult to shoulder these costs.

The Weld-Cellucci Administration made reform in these areas an early priority:

- A complete overhaul of the workers' compensation system is now saving small employers millions of dollars.
- Reform of unemployment insurance has stabilized the growth in costs, although high benefit levels relative to other states continue to impose a high relative cost on employers.
- Health insurance reform efforts have targeted small businesses. Pooling of policies across many small businesses has enabled risks and premium levels to be reduced.

Crosscutting Issues

Training

Most small businesses have difficulty funding and implementing complex training programs on their own. The Commonwealth is reforming its workforce development system in a manner that will serve the training needs of small businesses. The system will provide brokers between specific industries and providers of training services. Small businesses could join together in networks and work with brokers to identify their most critical training needs. This knowledge would be used by service providers and the firms themselves to jointly develop curricula to directly address these needs. A broker would also provide the network with up-to-date information on all training opportunities currently available. See Action Category 7 in Chapter 5.

Technology Transfer

The Commonwealth's efforts to facilitate technology transfer will be highly important to the growth of emerging companies. Technology transfer represents an existing strength of the Massachusetts economy through such institutions as the Massachusetts Institute of Technology Licensing Office, the Massachusetts Biotechnology Research Institute, and the Center for Technology Commercialization. However, the Commonwealth can build further on that strength.

The five campuses of the University of Massachusetts represent an invaluable asset for new and small technology-based businesses that can add to economic growth in their regions. The University campuses have an important role to play in nurturing local spin-off companies through their licensing capabilities, and the possibility of developing a new generation of incubator facilities on or near their campuses.

Further, the Commonwealth can help small businesses compete for federal grants related to technology transfer, particularly in the area of converting military technology to commercial uses. State government should support the creation of industry-specific partnerships between small Massachusetts companies, universities and nonprofit laboratories. The opportunities for improving technology transfer in Massachusetts are discussed in Action Category 9 in Chapter 5.

Know-How

The pressure on businesses to improve productivity by modernizing their equipment and facilities, as well as adopting best practices in management techniques and production processes, has especially serious implications for small businesses. Smaller firms can enhance their prospects by focusing on niche markets and employing flexible small batch production. However, new and small businesses usually do not have available staff to research and plan for the use of best practices. Even if they are aware of what these techniques and processes are, limited resources make implementation a formidable challenge.

The Commonwealth's efforts in disseminating this information can be particularly helpful to small businesses. An Industrial Extension Service could consolidate current programs that help businesses modernize, seek new funding from federal and other sources, and focus its resources on the special needs of small and medium-size manufacturers. Its principal roles would be those of catalyst and broker, identifying and disseminating knowledge through the industry networks discussed above in Training. These efforts would be linked to other economic development efforts in workforce development, technology transfer, financial and regulatory assistance and export promotion. A general discussion of the Industrial Extension Service concept is contained Action Category 8 of Chapter 5.

Chapter 8 Massachusetts Industry Profiles

In order to better understand the competitive advantages of the Commonwealth, and the regions within the Commonwealth, it is necessary to examine the competitiveness of the state's specific base industries and industry clusters. Base industries are those that sell substantial shares of their products or services to out-of-state customers. Their ability to compete nationally and internationally will determine the long term economic growth of the Commonwealth as a whole. Local industries are those which serve in-state customers, and are dependent on the prosperity brought by the base industries.

The Commonwealth is home to a variety of industry clusters. Four major clusters are identified in Professor Michael Porter's *The Competitive Advantage of Massachusetts* — health care, information technology, knowledge creation, and financial services. An industry cluster is defined by Porter as a group of rival firms, suppliers and customers, specialized research centers and skilled labor pools. Clusters increase the economic competitiveness of the firms within them, Porter argues, because an individual firm is able to draw on common skills, ideas, and innovations generated by the cluster as a whole that would not be present if the firm operated in isolation. Combined, these four clusters accounted for one third of total private sector employment in the Commonwealth in 1991.

The Commonwealth is also dependent upon the strength of particular industries which do not fall within clusters as formally defined. Major industries identified in this chapter are plastics, textiles and apparel, industrial machinery and equipment, paper and paper related products, fabricated metals, and tourism. These industries, while smaller than the above mentioned industry clusters, account for a significant employment share within the state. Combined, they represent 11 percent of total private employment in the Commonwealth. Figure 8A illustrates the regional distribution of total private employment in the Commonwealth. Figure 8B describes the statewide employment, wages and recent performance of these industries and clusters.

The significance of these industries becomes even more apparent when their employment share is examined within specific regions of the state. Maps accompanying each of the industry profiles which follow display industry employment at the community level, illustrating the concentration of industries within specific regions.

The industry analyses presented here provide a better understanding of the needs of the Commonwealth's base economy, and will serve to focus policy priorities in economic development. By no means is this an exhaustive list of the state's industries. As can be seen in Figure 8B, the majority of the state's total private employment is in sectors not profiled in this section. Some of this employment is within base industries such as jewelry, shoes, and instruments which are simply too small or diverse to easily profile. Most of this employment, however, is within local industries which are, in effect, dependent upon the base industries' ability to bring wealth into the state.

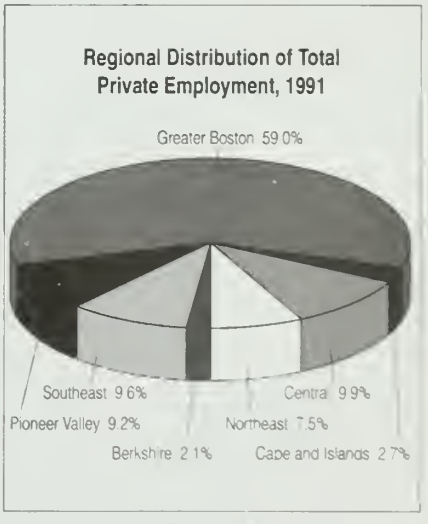


Figure 8A

Massachusetts Industry Profiles

MASSACHUSETTS PRIVATE SECTOR EMPLOYMENT IN PROFILED INDUSTRIES

INDUSTRY	1991 EMPLOYMENT	PERCENT OF MASSACHUSETTS PRIVATE SECTOR EMPLOYMENT	EMPLOYMENT CHANGE 1988-1991	1991 WAGES PER EMPLOYEE	WAGES INDEX (Private)
KNOWLEDGE CREATION	*175,350*	*7.3%*	*-0.1%*	*$38,759*	*1.39*
Legal Services	27,029	1.1%	0.5%	$42,071	1.51
Colleges and Universities	69,612	2.9%	2.2%	$30,072	1.08
Engineering & Arch. Services	27,192	1.1%	-14.4%	$44,713	1.61
Research and Test Services	24,390	1.0%	-5.0%	$42,323	1.52
Management and Public Relations Services	27,127	1.1%	16.5%	$48,577	1.75
HEALTHCARE	*306,976*	*12.8%*	*9.0%*	*$28,986*	*1.04*
Biotechnology and Medical Instrumentation	30,112	1.3%	2.2%	$37,910	1.36
Private Health Services	276,864	11.6%	9.8%	$28,015	1.01
. Offices of Medical Doctors	40,657	1.7%	15.8%	$44,525	1.60
. Nursing Care Facilities	57,936	2.4%	16.1%	$18,578	0.67
. Hospitals	130,218	5.4%	3.8%	$28,970	1.04
. Home Health Care	13,124	0.5%	61.8%	$17,885	0.64
INFORMATION TECHNOLOGY	*200,215*	*8.4%*	*-14.8%*	*$41,302*	*1.48*
Computer Technology	129,286	5.4%	-16.5%	$45,210	1.62
. Computers & Office Equipment	40,027	1.7%	-29.1%	$48,105	1.73
. Electronic Components	30,867	1.3%	-22.6%	$35,005	1.26
. Computer Services	39,888	1.7%	3.3%	$46,190	1.66
Telecommunications	68,499	2.9%	-11.1%	$35,390	1.27
. Communications Equipment	18,199	0.8%	-13.0%	$39,238	1.41
. Telephone Communications	21,662	0.9%	-12.7%	$41,732	1.50
FINANCIAL SERVICES	*143,501*	6.0%	-9.6%	*$36,378*	*1.31*
Commercial Banks	36,450	1.5%	-24.6%	$31,112	1.12
Savings Institutions	20,010	0.8%	-14.4%	$24,194	0.87
Security/Commodity Brokers	22,706	0.9%	17.8%	$64,885	2.33
Insurance Carriers	50,907	2.1%	-5.7%	$33,912	1.22
PAPER	21,050	0.9%	-13.6%	$31,540	1.13
PLASTICS	21,987	0.9%	-18.6%	$28,743	1.03
METALWORKING	48,396	2.0%	-10.0%	$32,738	1.18
APPAREL AND TEXTILES	31,560	1.3%	-17.9%	$23,100	0.83
MACHINERY	53,723	2.2%	-27.5%	$33,745	1.21
TRAVEL AND TOURISM	87,500	3.2%	-8.5%	NA	NA
TOTAL ALL PROFILED INDUSTRIES	*1,090,258*	*45.6%*	*-6.2%*	*$34,491*	*1.24*
OTHER MANUFACTURING	181,064	7.6%	-23.1%	$34,376	1.24
LOCAL INDUSTRIES	1,119,741	46.8%	-16.1%	$20,800	0.75
TOTAL PRIVATE EMPLOYMENT	*2,391,063*	*100.0%*	*-11.8%*	*$27,827*	*1.00*

NOTES: 1. 1991 Employment is Annual Average, ES-202. Employment Change is Fourth Quarter, 1988 to Fourth Quarter, 1991
2. Wage figures exclude Travel and Tourism employment. Wage index compares industry to state average of 1.00

SOURCE: Massachusetts Department of Employment and Training

Figure 8B

KNOWLEDGE CREATION

Composition of the Cluster

The "knowledge creation cluster" is a coinage of Professor Porter, contained in his study, *The Competitive Advantage of Massachusetts.* It includes higher education institutions, research and development laboratories (testing services), management and public relations consulting firms, law firms, and engineering and architectural services firms. These institutions and companies have close connections with each other, and have a major impact on other important business sectors in the Commonwealth. Many of the state's innovative information technology, biomedical and other firms emerged from its universities. Consulting, engineering, architectural and legal firms provide specialized services to these businesses. In turn, local knowledge-based companies and institutions form a market for computer equipment, measuring instruments, telecommunications equipment and software.

As illustrated in Figure 8C, over 80 percent of the Commonwealth's knowledge creation employment is located in the Greater Boston Region, with no other region comprising more than a 6 percent share. Figure 8D shows that the communities with the densest employment in the knowledge creation cluster are located in and around the city of Boston, with other important concentrations in Worcester, Springfield and Amherst.

Significance To The State's Economic Base

The knowledge creation cluster as a whole had an annual employment of 201,600 people in 1991 — or 7.2 percent of the state's total private employment. The largest employer in the group is colleges and universities, with 96,600 people or 47.9 percent of the industry's total, while the other four industries employ approximately 24,000 to 27,000 people each. Industry average wages of $38,760 are approximately 39 percent higher than average wages across all industries in the state. Average annual wages in the industry range from $30,070 for college and university employees to $48,580 for management and public relations services employees. Figure 8E shows average wages for the knowledge creation cluster for each of the Commonwealth's regions.

Competitive Position

The knowledge creation cluster in Massachusetts has given the state its worldwide reputation as a dynamic intellectual center. With over 120 colleges and universities, including some of the most distinguished institutions in the world, Massachusetts has a wellspring of academic talent that is second to none. Half of all Nobel Prize winners from the United States have been affiliated with Massachusetts-based educational institutions, and the state is second in the country in the number of residents who hold advanced degrees in science and engineering. While the Commonwealth has 3 percent of total U.S. employment, it typically receives approximately 6 percent of the federal government's research and development funds.

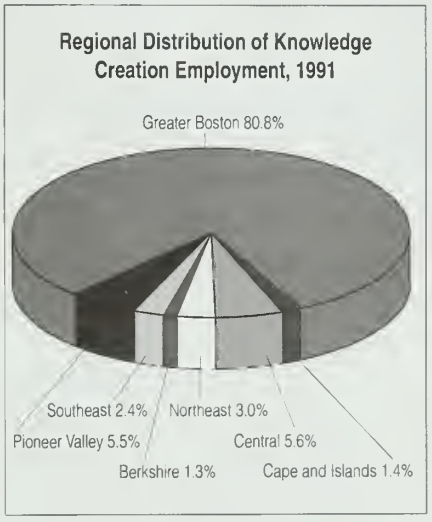


Figure 8C

Industry Conditions

Colleges and universities are at the center of the knowledge creation cluster. Students from all over the country and the world are attracted to Massachusetts' higher education institutions, and the fact that the state has the nation's highest percentage of 24-34 year olds with college degrees testifies to the attractive "staying power" of the area. The impact of the Commonwealth's colleges and universities reaches beyond simply educating some 250,000 students for one or more years: the universities also comprise a significant portion of the economy. MIT, Boston University and Harvard rank among the

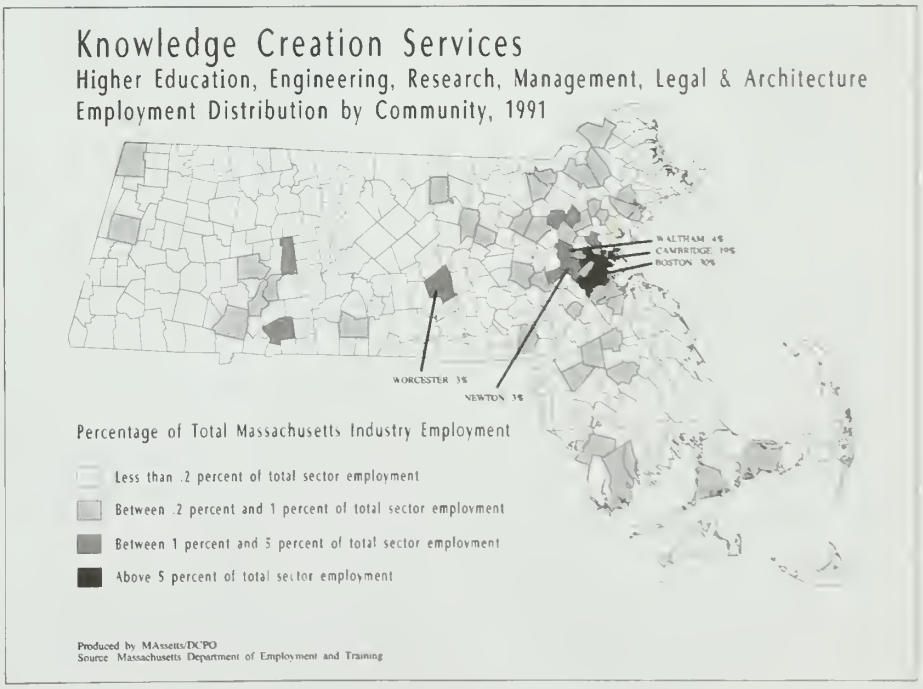

Knowledge Creation Services
Higher Education, Engineering, Research, Management, Legal & Architecture
Employment Distribution by Community, 1991
WORCESTER 3%
NEWTON 3%
Percentage of Total Massachusetts Industry Employment
Less than .2 percent of total sector employment
Between .2 percent and 1 percent of total sector employment
Between 1 percent and 5 percent of total sector employment
Above 5 percent of total sector employment
Produced by MAssetts/DCPO
Source Massachusetts Department of Employment and Training

Figure 8D

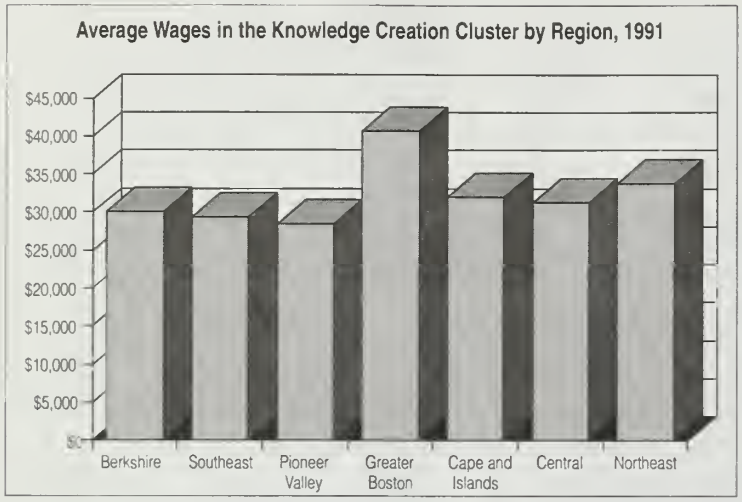


Figure 8E

largest 25 employers in the Commonwealth. Colleges and universities also have a major impact on innovation and new business creation through their research and technology transfer activities. The competitive challenge for colleges and universities is to maintain enrollment and research activities in the face of demographic and cost pressures.

Independent research laboratories, which compose the research and testing services industry, are responsible for developing commercial applications for technology research, as well as defense-related applications. The three major research institutions in the Boston area, Draper Laboratories, MITRE and Lincoln Laboratories, currently employ approximately 10,000 people. Massachusetts receives more than four times the national average of Department of Defense grants per capita, illustrating both the region's expertise and vulnerability to changes in the defense industry. Despite defense cutbacks, the Department of Employment and Training (DET) anticipates a 49 percent employment increase in independent research between 1991 and 2005 due to continued need for research and development by both industry and government. Tax incentives for companies to increase their research efforts and greater cooperation between industry, government and universities will also stimulate growth.

Management and public relations services firms have experienced extremely rapid growth over the past ten years. Massachusetts has been the birthplace for many of the industry's top companies, including global industry leaders such as Arthur D. Little, the Boston Consulting Group, Bain and Company, DRI, ABT, the Monitor Company and Harbridge House. Besides strategy consulting, there are firms in this group that specialize in information technology and financial services consulting. Approximately 13 percent of the firms listed in the 1990 national Directory of Management Consultants are located in Massachusetts. Other types of firms in this group include business and facilities management, public relations, and economic and social research services. Employment is expected to grow 38 percent between 1991 and 2005 due to businesses' continuing need to improve efficiency and cope with competition.

The knowledge creation cluster has a major impact on other business sectors. Many of the state's innovative information technology, biomedical and other advanced technology firms emerged from its universities. Consulting, engineering, architectural, and legal firms provide specialized services to these business.

Demand for ***legal services*** also expanded rapidly over the past decade. Total industry employment more than doubled. This growth can be explained by the overall growth of the economy, increased government regulatory activity, increases in class action lawsuits, and changes in business structure (e.g. mergers, acquisitions, leveraged buy-outs and takeover bids). The legal profession in Massachusetts is in the process of restructuring due to increased competition among law firms for business during the recession. Some law firms are freezing their rates, laying off associates and merging with other firms to provide more comprehensive legal services. However, legal services employment is expected to grow 48 percent between 1991 and 2005 due to the growing complexity of laws and import/export regulations, as well as to increased demand for legal services in the form of legal service plans (like group health insurance) and legal clinics.

Engineering and architectural services companies have been affected by the recession and as well as by a global slow down in construction of offices and other buildings, nuclear power plants and waste and water treatment facilities. Employment within this industry has decreased 16 percent, or 5,000 jobs, since 1989. Absorption of the office space erected during the building boom is expected to take much of the decade, and will keep this industry from increasing employment as fast as it did during the 1980's. However, government spending for infrastructure and environmental improvements will serve as a counter-trend, increasing demand for engineering and architectural services over the longer term. DET expects this industry's employment to grow 32 percent between 1991 and 2005.

General Outlook

As is clear from the discussion of individual components above, the outlook for the knowledge creation cluster is bright. Massachusetts has a clear competitive advantage in its concentration of research centers and talented research professionals. This concentration can be expected to both generate and respond quickly to new technologies. Given the accelerating cycle of innovation in the global economy, demand for the range of educational and professional services provid-

ed by the Commonwealth's knowledge creation cluster can be expected to grow.

HEALTH CARE

Composition of the Cluster

Massachusetts' health care cluster is world-renowned for its quality of treatment and pathbreaking research. The health care cluster of businesses and non-profit institutions consists of hospitals and other health care providers including specialized clinics; hospital, university and independent health research centers; medical instrument manufacturers; biotechnology and pharmaceutical companies; and medical laboratories.

Significance to the State's Economic Base

The health care cluster is the state's largest single industrial sector, employing just over 300,000 people statewide in 1991, and comprising 12.6 percent of total state employment. This figure does not include university and independent research centers carrying out health research; these are counted as part of the knowledge creation services cluster.

As a comparison of Figure 8A and Figure 8F illustrates, employment in the health care cluster is distributed very evenly across the Commonwealth's seven regions. There are, however, important local concentrations of education, research and the development and manufacture of medical instruments and biomedical products in and around Boston and Worcester. Average wages in the health care cluster were $28,986 in 1991. Figure 8G shows average wages for the health care cluster across the state's seven regions.

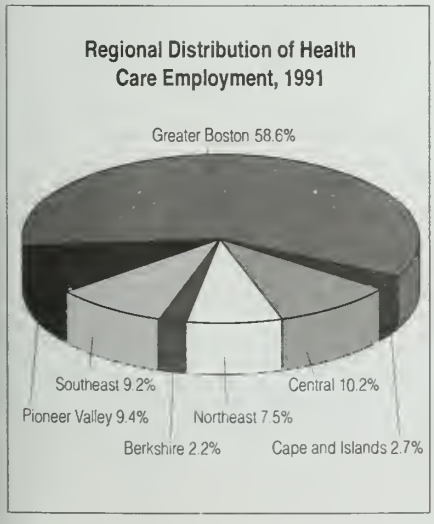


Figure 8F

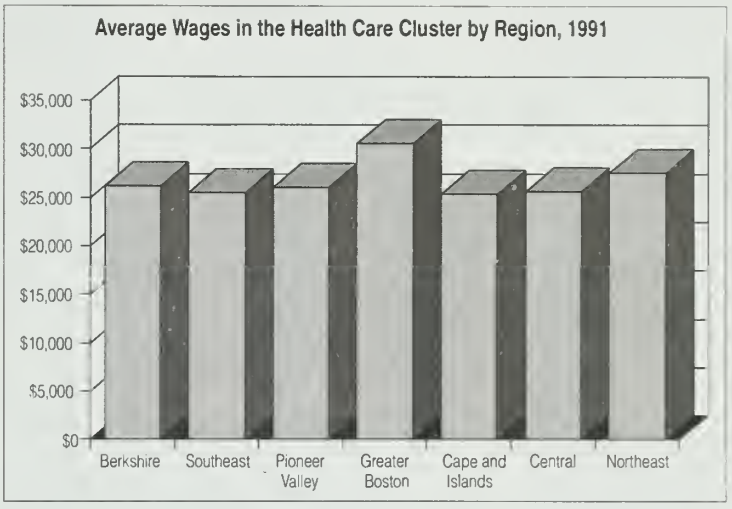


Figure 8G

Competitive Position

Health Services. Massachusetts has a world-renowned concentration of health care facilities. The complex of medical facilities in the city of Boston alone includes Massachusetts General Hospital, New England Medical Center, Brigham and Women's Hospital, Beth Israel Hospital, Boston City Hospital and other well-known institutions. The Worcester area benefits from the University of Massachusetts Medical Center, the Fallon Clinic, the Medical Center of Central Massachusetts, and others. Facilities throughout the state provide quality care to their regional populations. The health services industry has experienced roughly 36 percent employment growth over the past decade, from 204,000 to 277,000 between 1980 and 1991.

Drawing on the latest research and technology, Massachusetts hospitals are able to attract patients worldwide to the Commonwealth. Over $300 million in net revenues of Massachusetts hospitals came from out-of-state patients in 1989. Institutions such as Children's Hospital and the Dana Farber Cancer Institute draw over 20 percent of their patients from other states and abroad.

Health Research. Massachusetts' health care providers serve as testing sites for the latest innovative technologies and procedures developed by the state's medical research community. Innovation within the health care cluster is fed by the state's academic and medical institutions. With over 120 colleges and universities, the industry has access to an unparalleled concentration of faculty, students, laboratories, and university based research. Many of the state's leading hospitals also have extensive research facilities. Together with independent and corporate research centers throughout the state, this health research complex brought to Massachusetts over $770 million of federal health research grants in fiscal year 1992, along with many millions more in private nonprofit and corporate research dollars. Among the nation's cities, Boston was the largest recipient of federal health research dollars, Cambridge was 16th, and Worcester 48th.

Biotechnology. Massachusetts' health research is spurring rapid growth of biotechnology firms. The first biotechnology firm in the state, Biogen in Cambridge, was founded in 1979. Today, over 120 biotechnology firms are located in Massachusetts, employing an estimated 13,600 scientists, technicians, production workers and administrative personnel. The state's biotechnology industry is second only to California in total revenues and third in total number of companies. The activities of Massachusetts' biotechnology firms include the development and commercialization of vaccines,

drug delivery systems, artificial organs, genetic disease screening and industrial enzymes. In the Worcester area in particular, biotechnology is being applied to fields such as environmental cleanup and agriculture. Average annual wages for people employed in biotechnology were $39,167 in 1991.

Employment within the biotechnology industry is concentrated in the Greater Boston and Central Regions. Greater Boston is home to the majority of firms, with 30 in Cambridge alone. Genetics Institute, Genzyme, and Biogen all have headquarters in Greater Boston.

The Central Region is home to the Massachusetts Biotechnology Research Park, located adjacent to the University of Massachusetts Medical Center in Worcester. The Biotech Park currently houses facilities for 18 biotechnology companies including Cambridge Biotech, Genica Pharmaceutical, Hybridon, Inc., and TSI Corporation employing over 1,400 people. BASF Corp., a multinational chemical and health care company, is constructing a $100 million research facility at the Park on 30 acres of purchased land. The Park also serves as an incubator for a number of new biotechnology companies started through Commonwealth BioVentures, a subsidiary of the nonprofit Massachusetts Biotechnology Research Institute.

Medical Instruments. Medical instrument firms also are closely tied to Massachusetts' research and health care institutions, developing new products and techniques through research, and testing them in local clinical trials. Employment within medical instruments is concentrated in the Greater Boston, Northeast and Southeast regions. Large employers include Boston Scientific of Watertown, Haemonetics of Braintree, Hewlett-Packard's Medical Division in Andover and Waltham, Codman & Shurtleff of New Bedford, and Instrumentation Laboratory of Lexington.

The types of products developed within the industry include diagnostic products, surgical supplies, lasers for eye and heart surgery, blood processing machines, and laboratory analytical instruments. The industry is characterized by many small to medium-size firms involved in high technology niche markets. The average wage for people employed in the medical instruments industry was $36,162 in 1991.

General Outlook

With an aging national population, continued employment growth can be expected in the health services industry in the coming decade. According to recent projections by the Massachusetts Department of Employment and Training, employment within various health services can be expected to grow by 31 percent between 1991 and 2005. In turn, this growth in health services will lead to continued growth in related industries such as biotechnology and medical instruments.

The greatest challenge to the biotechnology industry is the need for high-cost, state of the art laboratory and production facilities that have trouble gaining construction loans from area banks.

A potential cloud on the horizon, from the perspective of the growth prospects of the health care cluster, is health insurance reform. This *Strategy* has identified health insurance reform as an important part of the task of reducing high business costs in the state. It must be recognized that one of the results of an effective health insurance reform would be to slow the flow of resources into the health care cluster.

INFORMATION TECHNOLOGY

Composition of the Cluster

The information technology cluster is also identified by Professor Michael Porter in *The Competitive Advantage of Massachusetts.* The cluster is comprised of a diverse group of industries, including computers, software, peripherals, information technology related professional services, information retrieval services, telecommunications equipment and services, and electronic components such as circuit boards and semiconductors. What binds these industries together is their close functional interdependence. Electronic components and computers are needed for the manufacture of telecommunications equipment, and information providers rely heavily on the telecommunications industry to provide the means by which information is transmitted.

As illustrated in Figure 8H, the information technology cluster is located primarily in the Greater Boston and Northeast Regions. Figure 8I shows that there are also important information technology employers in and around the Worcester area.

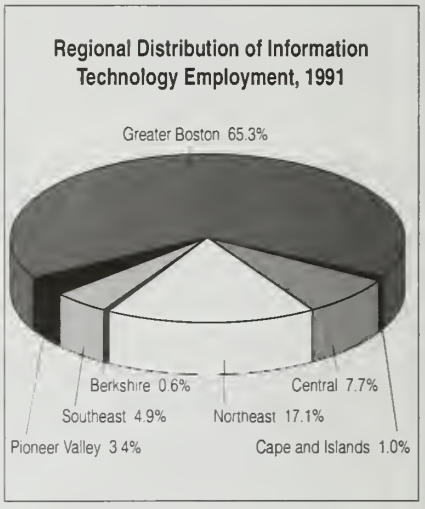


Figure 8H

Significance to the State's Base Economy

The Commonwealth has the highest concentration of information technology employment in the nation. In 1991, the cluster employed 173,110 people, or 7.2 percent of total employment. The information technology cluster is an important source of high-paying jobs for the Commonwealth. Average annual wages within the cluster of $42,280 in 1991 are 52 percent higher than in the private sector as a whole. Massachusetts information technology wages are also 9 percent higher than the national average for similar jobs. Figure 8J shows how wages in Massachusetts' information technology cluster vary by region.

The Computer Hardware Industry. The computer and office equipment industry

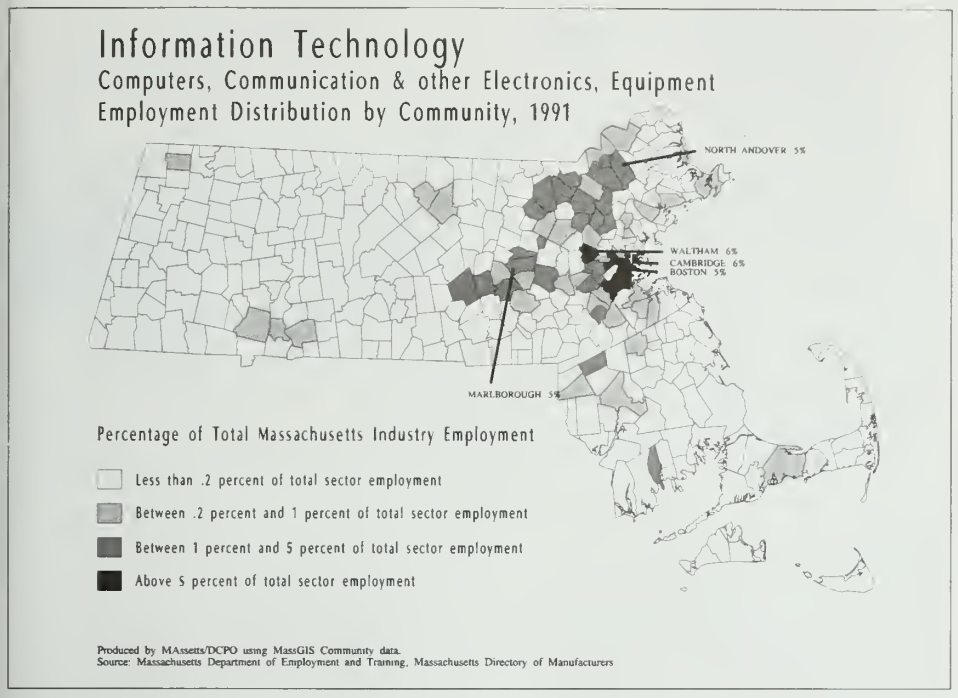

Information Technology
Computers, Communication & other Electronics, Equipment
Employment Distribution by Community, 1991
NORTH ANDOVER 5%
WALTHAM 6%
CAMBRIDGE 6%
BOSTON 5%
MARLBOROUGH 5%
Percentage of Total Massachusetts Industry Employment
Less than .2 percent of total sector employment
Between .2 percent and 1 percent of total sector employment
Between 1 percent and 5 percent of total sector employment
Above 5 percent of total sector employment
Produced by MAssetts/DCPO using MassGIS Community data.
Source: Massachusetts Department of Employment and Training, Massachusetts Directory of Manufacturers

Figure 8I

contributed 40,030 jobs to the Massachusetts economy in 1991. Its average annual wage was $48,110. Despite its large size, however, the Massachusetts computer industry has suffered greatly as a result of the decline of the minicomputer and mainframe markets. Large Massachusetts firms such as Computervision and Digital Equipment Corporation have been forced to reorganize and make deep cuts. Wang Laboratories has been forced to file for Chapter 11 bankruptcy. These structural problems caused employment in the industry to drop 29.1 percent between the fourth quarter of 1988 and fourth quarter of 1991. Despite these problems, there remains a vital and highly innovative core of computer companies. Stratus' fault tolerant computers and Hewlett-Packard's workstation business both continue to thrive. Kendall Square Research and Thinking Machines Inc. are leading the market for cutting-edge massively paralleled super computers.

The Computer Software Industry. The Commonwealth is home to over 1,200 software companies which collectively employ more than 33,500 people and generate $2 billion in revenue. Average annual wages were $46,190 in 1991. These companies include global leaders in software development such as Lotus, Interleaf, Banyan Systems and Software 2000. Massachusetts software engineers and designers are working on the leading edge of artificial intelligence, voice recognition, and defense-related software. These efforts should help to insure a strong market position for the state's software industry in the face of intensifying competition from the outside world in conventional consumer products.

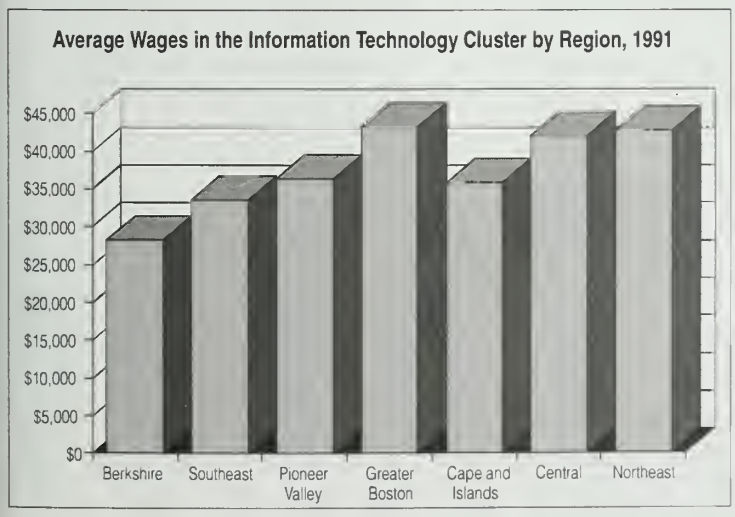


Figure 8J

The Telecommunications Industry. With 170 telecommunications firms in the Commonwealth employing nearly 60,000 people, Massachusetts has the highest concentration of telecommunications firms in the country. Average annual wages were $39,870 in 1991. These firms provide hardware, services and software for both voice and data communications. The industry is represented by companies such as AT&T Network Systems in North Andover, and GTE in Taunton. In addition to these established giants, there are a large number of smaller firms accessing such market niches as fiber optic transmissions, data internetworking, and fault tolerant switching. Three small Massachusetts firms, Xyplex, Chipcom and Proteon, have been cited by Business Week Magazine as among the Best Small Companies in the country. Massachusetts accounts for 11 percent of the nation's communications equipment production and nearly 50 percent of the worldwide market for internetworking equipment.

Competitive Position

Massachusetts has an unparalleled history of innovation and leadership in information technology. From Alexander Graham Bell's first telephone conversation over a century ago to the patenting of the first computer spreadsheet, database, word processing, and desktop publishing programs, Massachusetts has produced a steady stream of landmark innovations in information technology. The Commonwealth has also produced a string of leading information technology companies which have transferred the state's technological achievements into powerful employment and revenue producing industries.

Massachusetts' Information Technology cluster possesses strong competitive advantages

that will keep it at the forefront of innovation in several fast growing worldwide markets:

- *Sophisticated Customer, Rival and Supplier Relationships.* One of the most significant trends in information technology is the convergence of computer and telecommunications technology, both of which are strengths in Massachusetts. Virtually all telecommunications systems are now run by computers and almost all computing involves the use of communications lines and networks. Demand for ever more powerful communications and ever more "open" computer systems will continue to drive and accelerate this trend. Viewed from the vantage point of the Massachusetts economy, this rapid technological change offers a major opportunity. The Commonwealth already leads the country in telecommunications and computer software, has major computer producers, and is the global leader in the emerging "industry" involving the creation of networks linking communication and computers. While this is already of great advantage to the telecommunication and computer industries, Massachusetts is exceptionally well-placed to be a leader in the emerging market for a host of new, highly sophisticated multi-media information technology products.
- *University and Research Support.* The Commonwealth's information technology cluster profits immensely from the state's world class university and research laboratories. Not only do these institutions attract bright individuals from around the globe to Massachusetts, but they also provide a constant creative and innovative resource. In 1989, Massachusetts received over 7 percent of all National Science Foundation research grants and 14 percent of all defense research grants. Much of this research finds its way to information technology applications.
- *Skilled Workforce.* Massachusetts information technology firms enjoy a significant advantage over producers in most other parts of the country in that they are able to draw upon the Commonwealth's unparalleled pool of skilled and experienced workers. Massachusetts ranks first nationally in terms of the number of science graduates it produces, providing firms with a steady stream of highly qualified new talent. Moreover, the large concentration of information technology firms in the Commonwealth means that there is an extraordinary wealth of knowledge and experience with information technology manufacturing available to help firms start and grow.

General Outlook

Between 1988 and 1991, the information technology cluster grew at a slower rate in Massachusetts than in the nation as a whole and lost 30,000 jobs. These job losses were concentrated in the minicomputer industry (15,000 jobs lost) and semiconductor manufacturing (6,000 jobs lost). Prepackaged software firms meanwhile created 3,000 new jobs, increasing their total employment by 46 percent. The outlook for future employment growth in the cluster is mixed. The industry is characterized by relatively short term booms brought about by emerging products and advances in computing or organizational efficiencies. Future growth will be predicated on continued innovation, and the development of emerging technologies. Areas of possible growth may be in data communications and in the expanding "internetworking" market, which is expected to grow at a rate of 30 percent to 40 percent per year.

FINANCIAL SERVICES

Composition of the Cluster

Massachusetts' financial services cluster includes banks and savings and loans (depository institutions), credit agencies and mortgage bankers and brokers (nondepository institutions), security and commodity brokers, insurance carriers, insurance agents and brokers and real estate developers and managers.

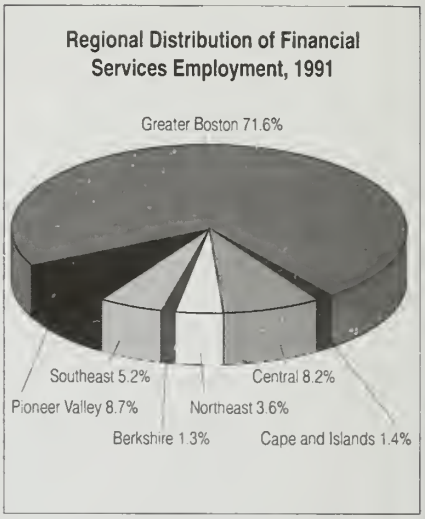


Figure 8K

As illustrated in Figure 8K, the statewide employment in the FIRE cluster is principally located in the Greater Boston Region. There are, however, also important cluster concentrations in and around the cities of Springfield and Worcester (See Figure 8L).

Significance to the State's Economic Base

In 1991, there were approximately 201,200 people (or 7 percent of the state's workforce) working in the Finance, Insurance and Real Estate (FIRE) industries,. The two largest employment categories are depository institutions and insurance carriers, with approximately 64,000 and 53,500 people respectively. Real estate firms employed 28,100 people, security and insurance brokers each employed almost 23,000 people, and nondepository institutions employed 10,600 in 1991. Average wages for the industry as a whole were $36,380 in 1991, approximately 31 percent above the statewide average. Wages vary widely within the group: the average wage for people working in depository institutions was $28,400, while the average wage for security and commodity brokers was $64,890. Figure 8M reflects how average wages in the FIRE industries vary from region to region. Compared with similar jobs in other states, employees in Massachusetts' FIRE industries earn incomes 10 percent higher than the national average.

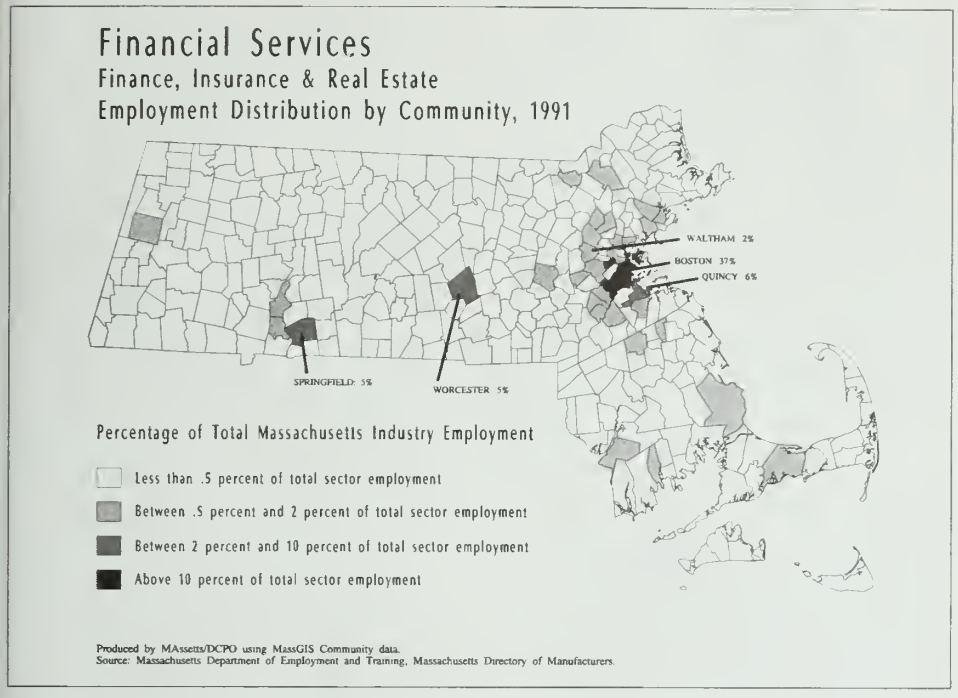

Financial Services
Finance, Insurance & Real Estate
Employment Distribution by Community, 1991
WALTHAM 2%
BOSTON 37%
QUINCY 6%
SPRINGFIELD 5%
WORCESTER 5%
Percentage of Total Massachusetts Industry Employment
Less than .5 percent of total sector employment
Between .5 percent and 2 percent of total sector employment
Between 2 percent and 10 percent of total sector employment
Above 10 percent of total sector employment
Produced by MAssetts/DCPO using MassGIS Community data.
Source: Massachusetts Department of Employment and Training, Massachusetts Directory of Manufacturers.

Figure 8L

Recent History

The financial services industry has undergone dramatic change, both nationally and in the Commonwealth. The 1980s was a period of dynamic growth and prosperity for many segments. Deregulation, a wave of merger and acquisition activity, and investor appetite prompted rapid and profitable expansion. Firms entered higher risk activities such as real estate lending, and diversified into new segments of financial services. From 1980 to 1988, employment in the Commonwealth's FIRE industries increased nearly 45 percent, while payroll doubled. The Wall Street crash of 1987, the collapse of the junk bond market, and the sharp declines in the real estate market signalled an end to this period of rapid growth and coincided with the steep downturn of the regional economy. While the financial services industries generated 62,500 jobs between 1980 and 1988, 17,600 of these were lost by 1991. Although the sector is still suffering from both cyclical and structural pressures at this time, several of the financial services industries have above average growth potential.

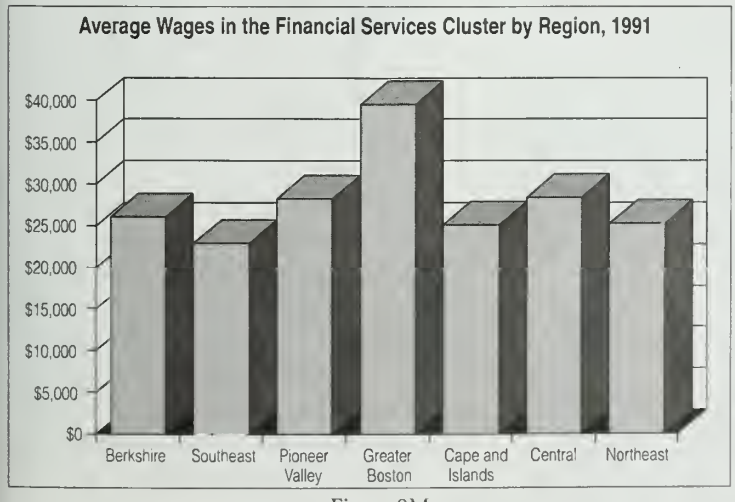


Figure 8M

Industry Conditions and Outlook

Banks and other depository institutions were profoundly affected by deregulation. Under the Depository Deregulation and Monetary Control Act, Massachusetts banks were free to pursue new lending opportunities and did so aggressively. They became bigger institutions with more capital and assets and larger branch networks. When the Massachusetts economy turned down, this sector experienced dramatic revenue losses. Several Massachusetts banks collapsed under the weight of non-performing real estate loans and other high risk financial investments, including one of the state's largest — the Bank of New England, which went under in 1991. To cover their losses, banks sharply cut costs, eliminating approximately 10,000 jobs between 1988 and 1991 (over half of FIRE's total losses in this period). Job growth in banks and other depository institutions is expected to continue to trail the growth of nondepository financial institutions in the 1990s. The drive towards industry consolidation will continue in the short term. Future employment losses can also be expected as new technology continues to increase the efficiency of banks' back office functions such as payroll and check processing. The result of consolidation, however, will be that remaining banks will be in better shape to attract fresh capital and improve their market shares.

Nondepository institutions and security and commodity brokers grew rapidly during the 1980s. Led by asset managers such as Fidelity and The Boston Company, security and commodity broker employment quadrupled from 1977 to 1990, making it the fastest growing industry in the sector. Demand for mutual funds and securities expanded as the combination of deregulation and interest rate ceilings in traditional financial institutions prompted investors to seek alternatives to traditional savings methods.

In Massachusetts, many of these firms expanded faster than in other parts of the country, and Boston is one of the nation's major investment centers. Both the Commonwealth's leadership position and the industry's growth in employment is expected to continue due to the baby boom generation's increasing need to save for their children's education and their own retirement. The Department of Employment and Training projects that employment in nondepository institutions will grow 43 percent

between 1991 and 2005, and employment in securities and commodities brokerage will grow 31 percent.

Massachusetts is also a leading ***insurance*** center: the state contains the headquarters of 18 major life insurance and 55 major property and casualty insurance companies. While many of these are located in the Greater Boston region, there are sizeable concentrations of employment in the Worcester area and the Springfield area. Though the Commonwealth's insurance companies enjoy competitive advantages due to their size, reputation and diversity, they have recently faced a heightened competitive environment. Life insurance products with a savings component have to compete with mutual funds and other forms of investment, while a key issue for property and casualty firms is financial soundness. Both types of firms are under pressure from rising distribution costs and need to improve profitability. They have been doing this by reducing overhead and increasing the use of technology and automated systems — both of which have led to payroll cuts. Consequently, insurance carriers are expected to experience only modest employment growth (8 percent) in the 1990s. However, jobs with smaller insurance agents and brokers are expected to grow approximately 20 percent from 1991 to 2005. Due to the personal service component of these jobs, they are less likely to be impacted by automation.

Employment within the ***real estate industry*** is highly cyclical. Aggressive building throughout the previous decade caused supply to outstrip demand, which remains a problem. This situation was exacerbated by speculation by institutional and foreign investors. Prior to the Tax Reform Act of 1986, the tax code stimulated both construction and investment in real estate projects, which were attractive to investors seeking higher returns than could be found in traditional investment vehicles. When investors pulled out of the market in the late 1980s, driven in part by adverse tax changes in the Tax Reform Act of 1986 and in part by surplus inventory, real estate prices fell precipitously. This both contributed to and was exacerbated by the severe recession. Today, demand for commercial real estate has slowed to a trickle throughout most of the Commonwealth. Demand for residential real estate also remains weak. Over 6,000 jobs have been lost since 1987. However, as stated, this industry is cyclical, and should improve once the economy improves. The Department of Employment and Training expects a 16 percent increase in real estate jobs between 1991 and 2005, which would amount to 4,500 new jobs.

General Outlook

As detailed in the above analysis, employment growth prospect in FIRE industries are uncertain in the short run. Long-term growth in insurance and asset management may result from the creation of new services and the expansion of markets. The banking industry may be poised for future growth following the current restructuring.

Both the Commonwealth's leadership position and the financial industry's growth in employment is expected to continue due to the baby boom generation's increasing need to save for their children's education and their own retirement.

PAPER AND PAPER RELATED PRODUCTS

Industry Composition

The paper manufacturing cluster consists of two primary categories of firms. One type encompasses the primary producers, or mills, which produce pulp, raw paper and paperboard materials. The second, larger group are the paper converters who turn the mill output into finished consumer products such as notepads, tags, boxes and envelopes. Additional components of the industry include paper recyclers and manufacturers of paper machinery.

Significance to the State's Economic Base

In 1991, the paper industry provided Massachusetts with 21,050 jobs. Although not a major industrial concentration on a statewide basis, paper manufacturing remains important to many of the Commonwealth's rural and small city areas. In Berkshire county, for example, the paper cluster provided 6.7 percent of all employment in 1989. In the Springfield metropolitan area, the paper industry constituted nearly 4 percent of 1991 private sector employment. As illustrated in Figure 8N, the primary concentrations of the modern paper industry are in the Holyoke/ Westfield/Springfield area of the Pioneer Valley, Framingham in Greater Boston, and Dalton in the Berkshires. There is significant employment in the Northeast Region as well.

The paper industry also supplies relatively high-paying jobs to the Massachusetts economy. In 1991, average wages in the paper industry of $31,540 were 13 percent higher than the statewide private sector average (See Figure 8B).

History

The Massachusetts paper industry can trace its roots back to the nineteenth century, when the south central part of the state ranked as one of the nation's most important paper-making regions. In the 1850s, Holyoke, known as "The Paper City," alone had over 50 paper manufacturers while heavy industry concentrations existed around Springfield and central Berkshire County. Originally, the forests of the western part of the state and water resources provided by its rivers fostered the development of a large number of primary producers in Massachusetts. Over the years, however, the number of primary

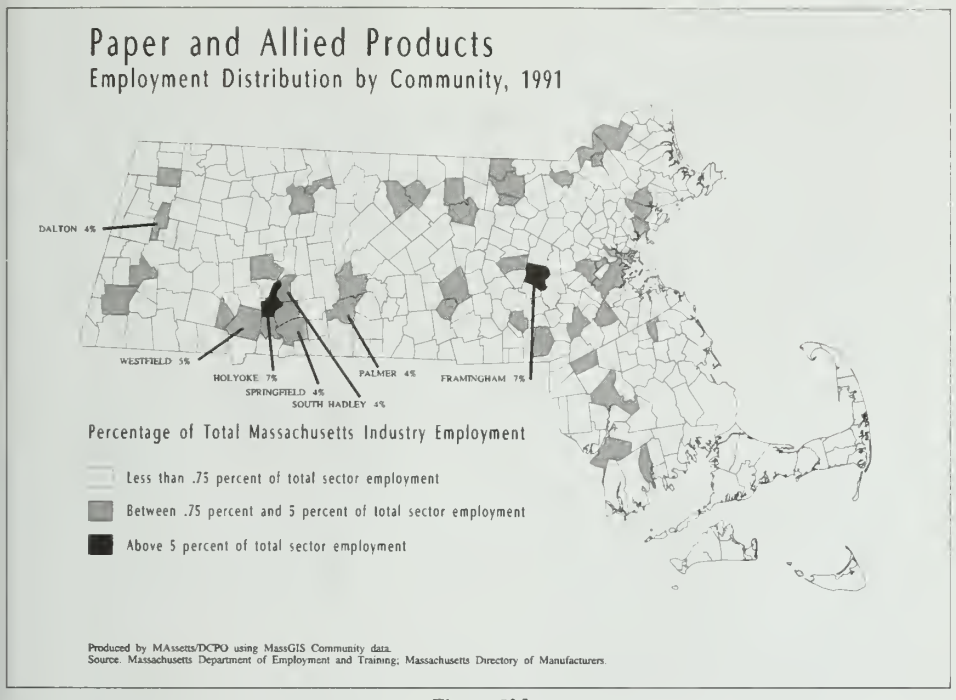

Paper and Allied Products
Employment Distribution by Community, 1991
DALTON 4%
WESTFIELD 5%
HOLYOKE 7%
SPRINGFIELD 4%
SOUTH HADLEY 4%
PALMER 4%
FRAMINGHAM 7%
Percentage of Total Massachusetts Industry Employment
Less than .75 percent of total sector employment
Between .75 percent and 5 percent of total sector employment
Above 5 percent of total sector employment
Produced by MAssetts/DCPO using MassGIS Community data.
Source: Massachusetts Department of Employment and Training; Massachusetts Directory of Manufacturers.

Figure 8N

manufacturers has declined dramatically. By 1987, only 15 percent of the paper firms in the Commonwealth were primary producers. Paper converters have been more stable in both numbers of firms and employment. The Massachusetts paper industry has contracted greatly as a result of the emergence of new energy sources, technology, and raw material supplies.

Competitive Position of Paper Converters

Paper converters — those firms that make finished products out of raw paper — have generally done well in Massachusetts. They have not faced the same structural impediments which mills have, and many have shown an ability to innovate and adapt. As demand for typing paper declined after the introduction of the word processor, Massachusetts companies responded by catering to the growing demand for computer and facsimile paper. The Commonwealth is particularly strong in specialty paper products. Westfield's Strathmore Paper Company is achieving strong growth by producing special cotton fiber bond writing paper and paper supplies for artists with a workforce of 855 people. It was also a small Berkshire firm which was chosen to produce the invitations for the Presidential inauguration. Firms such as Crane and Kimberly-Clark are international leaders in high quality stationery products.

The Commonwealth's strength in this sector is owed to the skill of its workers and flexible manufacturing practices. Massachusetts' medium and small-sized paper firms are able to meet individual customer demands far faster and more efficiently than their larger competitors and have been able to capture niche markets. Demand for specialty paper products is expected to increase in the future and export sales growth is expected to be particularly strong. A number of Massachusetts firms have made extensive investments in plant and equipment recently which will give them a strong competitive position for the future. Another of these firms' advantages, in fact, is the presence in Massachusetts of several important paper machinery manufacturers who develop equipment tailored to their needs.

Primary Producers

The good news is not limited to the converters. If they invest appropriately, Massachusetts' primary paper producers can benefit from the increased trend towards paper recycling. Recent studies project nearly 31 percent growth in the use of recycled paper between 1990 and 1995, and an 86 percent increase in the reuse of waste paper for manufacturing printing and writing paper. This forecast is based in part upon the decision by 34 states and the Federal Government to pursue affirmative recycled paper purchasing programs, a number of private purchasing programs, and the state-brokered agreement by Massachusetts newspaper and directory publishers to boost their recycled paper content to 40 percent. Apart from its projected growth, recycling can be attractive to the primary producers because it requires less water and energy to remanufacture waste paper than use new fibers. Recycling thus allows Massachusetts mills to overcome their primary disadvantages with respect to virgin paper manufacturing. Of the Commonwealth's 34 remaining paper mills, 10 already use exclusively waste paper for input and 22 others use at least some waste paper.

The recycling of waste paper currently contributes $475 million of value added to the Massachusetts economy each year — a figure which will increase in the future.

Massachusetts firms have a number of advantages over firms in many other parts of the country which will help them to continue to capture a large share of the national and international recycled paper markets. Many mills already have an established position in this field which means that they will not have to reequip their facilities in order to expand their market share. The Commonwealth's existing mill structures are also generally located near urban areas, which means that they are close to the primary sources of waste paper and the resale centers. The small size and niche-orientation of many Massachusetts mills will help them adapt to the changing needs of this emerging market.

General Outlook

Recent statewide job performance for the industry has been poor, with employment

declining nearly 15 percent between 1986 and 1991. Although major employment growth in the Massachusetts paper industry is unlikely, continued success in niche, specialty paper markets and growth in recycled paper manufacturing should help stabilize employment in the industry. The paper industry appears to be one of the traditional manufacturing industries where Massachusetts can remain competitive through innovation, training, the capturing of niche markets, and the development and use of new technology.

PLASTICS

Industry Composition

The Massachusetts plastics industry includes compounders, resin producers, mold designers, mold builders, molders, heat treaters and finishers. These firms manufacture items ranging from price tag fasteners to intravenous feeding tubes and other delicate medical instruments. Although virtually all forms of plastic products and services are represented, the Commonwealth does have a particularly distinguished group of custom producers of high-quality plastic parts, components and models. There are many small niche manufacturers which are engaged in sophisticated extrusion and vacuum molding processes. There are also a large number of producers specializing in high-quality electronic and medical components. One such producer is Nypro of Clinton, which is one of the world's largest custom injection molders.

Significance to the State's Economic Base

With a total of 556 processing plants, the Commonwealth has the fourth largest plastics industry nationwide. In 1991, manufacturers of plastic materials provided the Commonwealth with approximately 22,000 jobs. Average wages were $28,760 in 1991 (See Figure 8B). As Figure 8O illustrates, the industry's heaviest concentration is located in the Leominster-Fitchburg-

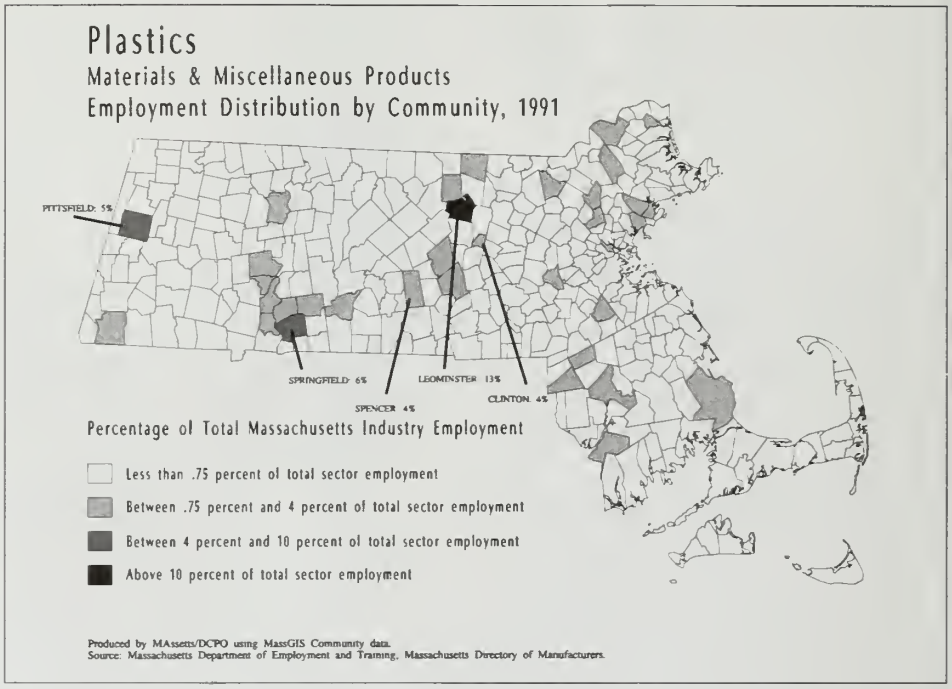

Plastics
Materials & Miscellaneous Products
Employment Distribution by Community, 1991
PITTSFIELD 5%
SPRINGFIELD 6%
SPENCER 4%
LEOMINSTER 13%
CLINTON 4%
Percentage of Total Massachusetts Industry Employment
Less than .75 percent of total sector employment
Between .75 percent and 4 percent of total sector employment
Between 4 percent and 10 percent of total sector employment
Above 10 percent of total sector employment
Produced by MAssetts/DCPO using MassGIS Community data.
Source: Massachusetts Department of Employment and Training, Massachusetts Directory of Manufacturers.

Figure 8O

Clinton area, where there are over 150 plastics firms which collectively represent over 25 percent of local employment. Pittsfield, Springfield, and Spencer also have substantial plastics industries.

History

The American plastics industry got its start in a Leominster comb-making factory in the late nineteenth century. Although plastics were invented elsewhere, Massachusetts saw the first broad commercial application of the technology. The Massachusetts plastics industry has changed greatly since those days, but it continues to be an innovative force nationally which also plays an important role in the state economy.

Competitive Position

Although industry changes have diminished the Commonwealth's once dominant position in plastics, the Massachusetts plastics cluster continues to possess important strengths relative to other areas of the country.

- *Highly skilled labor.* Specifically, the Massachusetts plastics labor force has developed highly advanced and specialized skills. The importance of these skills is clearly illustrated by Kelly Plastics, which moved its operations outside Massachusetts but was forced to return after discovering that employees at its new location were unable to operate its machinery.
- *Research Resources.* Another advantage is the leading-edge research conducted in Massachusetts on polymer development and application. The University of Massachusetts at Lowell and the University of Massachusetts at Amherst are both regarded as among the leading polymer research institutions in the nation. The University's program to assist companies in instituting statistical process control systems is one example of the dividends derived from these academic resources. The GE Polymer Process and Development Center in Pittsfield and Monsanto's Springfield laboratory are counted among the top corporate plastics facilities in the country. Together, these facilities give the Massachusetts plastics industry a major advantage in developing new types of materials, new uses for plastics and more efficient production systems.

- *Demanding Customers.* The Massachusetts plastics cluster has been recognized for its aggressive utilization of new technologies, an indication that the cluster benefits from highly sophisticated demands of advanced technology firms located in the state.
- *Supporting Industries.* Plastics manufacturers have profited from the presence in the Commonwealth of plastic machinery manufacturers such as Battenfield Gloucester, Martin Industries and Nelmore. The cluster also benefits from the large number of metalworking firms in the Commonwealth which use sophisticated tooling and precision design to create plastic extrusion molds for plastics firms.

New Products

Massachusetts companies are involved in constant innovation and product development. GE has recently begun marketing a reusable plastic container for liquids which should have widespread applications in the food processing industry. A number of Massachusetts companies are developing light plastic materials which can be used by the automobile industry to replace steel, subsequently allowing auto makers to meet federal gasoline mileage requirements. Others are developing new plastics which could replace the expensive metal coatings used in the electronics industry. Massachusetts is also one of the first states to have firms marketing Balland, an acrylic polymer which dissolves in hot water. Scientists at the University of Massachusetts at Amherst are working on a biodegradable polymer.

Recycling

Massachusetts has 20 companies which process waste plastic for reuse. Enviro Plastics Corporation in Auburn, for example, is a start-up company which has created a process for recovering polyethylene from items such as milk jugs and soda bottles for reuse. Although plastic recycling is still in its infancy as a commercial endeavor, Massachusetts has a considerable head-start on most other parts of the country in what seems likely to emerge as a future high growth business area.

General Outlook

Although employment in the plastics industry declined 18.6 percent between 1988 and 1991 as a result of a dramatic fall in demand from automobile and minicomputer manufacturers, the industry appears poised for strong future growth. Its technological sophistication and strong position in growth markets such as recycled plastics gives the Massachusetts plastics industry an excellent competitive position. As a wide range of manufacturers look to replace traditional metal parts with stronger, lighter and more durable plastic components, Massachusetts will be well-placed. The Commonwealth's concentration of small, highly flexible and technologically advanced plastics firms should be able to adapt to market needs and conduct the product and process innovation which will be essential to remaining competitive.

PRIMARY AND FABRICATED METALS

Industry Composition

The primary metals industry is comprised of firms involved in the manufacture of steel and aluminum products. The fabricated metals industry is made up of firms involved in the production of metal-formed products such as cutlery and parts for military components, computers, and other goods. It also provides inputs in the production of machinery used by some of the Commonwealth's key manufacturing industries such as plastics and paper.

Significance to the State's Economic Base

The Commonwealth's metals industry is composed of approximately 219 primary metals and 1,158 fabricated metals firms located across the state. The two metals industries employed approximately 48,500 people in Massachusetts in 1991. Together, they represent 2 percent of the Commonwealth's total employment. Primary metals employed 10,300 with aver-

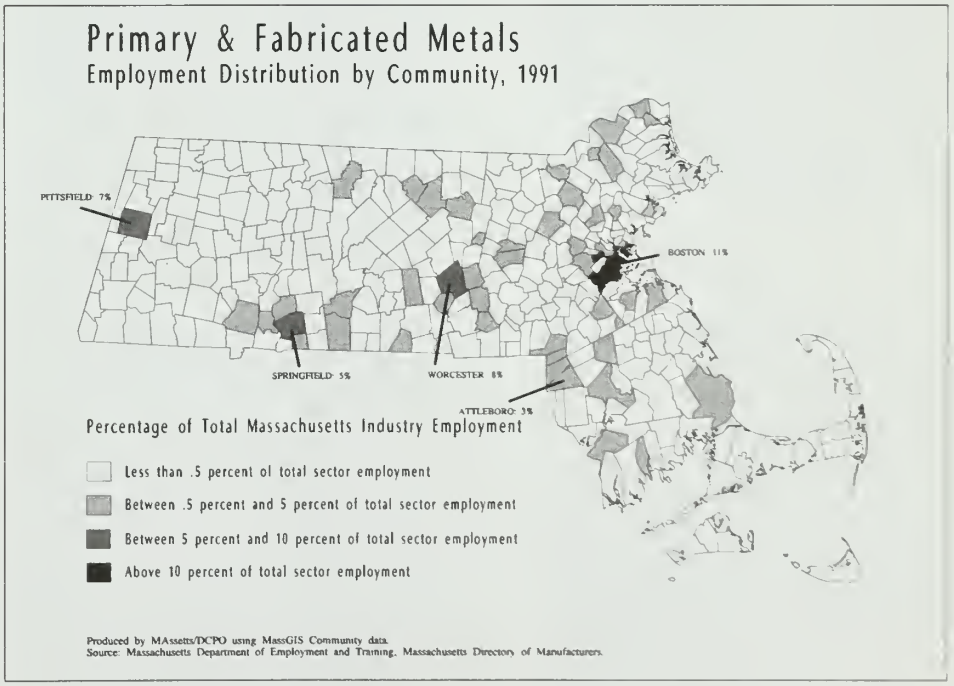

Primary & Fabricated Metals
Employment Distribution by Community, 1991
PITTSFIELD: 7%
SPRINGFIELD: 5%
WORCESTER: 8%
BOSTON: 11%
ATTLEBORO: 3%
Percentage of Total Massachusetts Industry Employment
Less than .5 percent of total sector employment
Between .5 percent and 5 percent of total sector employment
Between 5 percent and 10 percent of total sector employment
Above 10 percent of total sector employment
Produced by MAssetts/DCPO using MassGIS Community data.
Source: Massachusetts Department of Employment and Training, Massachusetts Directory of Manufacturers.

Figure 8P

age annual wages of $30,435, while fabricated metal products employed 38,200 with average annual wages of $33,354 (See Figure 8B). Wages are approximately 18 percent above the statewide average. The two largest categories of fabricated metal products are cutlery, handtools and hardware, with 1991 employment of 7,900, and fabricated structural metal products, with employment of 7,400. As can be seen from Figure 8P, employment within the metals industry is scattered throughout the state. Particularly important centers are Boston, Worcester and Springfield, plus the smaller cities of Pittsfield and Attleboro. A major customer of the Commonwealth's fabricated metal parts are Connecticut-based defense contractors, illustrating the industry's status as an export-oriented base industry.

Competitive Position

Most metalworking companies are subcontractors ranging in size from 30 to 50 employees each. The subcontractors compete on the basis of price, quality and timely delivery in the machining or casting of component parts, subassemblies, fixtures, gages and tools for larger firms. Some metalworkers have developed specialties in certain products and some have developed specialties in certain processes, like plating. A few have developed expertise in the use of advanced machining techniques, and this has given them some competitive advantage; however, most metalworking firms have no proprietary technology.

In addition to the investments that the industry has made in up-to-date capital equipment, other competitive advantages include a strong network of firms providing complementary services located near each other, and the industry's skilled workforce. The wide range of products and services offered enables metalworking firms to perform most machining functions and special processes locally. Shop owners can bid on contracts knowing that the broad range of local skills will enable them to outsource any work beyond their shop's capabilities. Close relationships among firms with complementary skills allow many within the area to benefit from the awarding of a single contract. However, the downside of this is that most metalworking shops have not had to extend their contacts. The Machine Action Project, an organization designed to assist the metalworking industry with research and training programs, found that approximately 80 percent of these Massachusetts firms sell only in New England. Massachusetts' metal working shops must expand their customer base geographically (as well as across industries) in order to reduce their vulnerability to regional downturns.

Customer Base

The three largest industries served by the Commonwealth's metalworking shops are aerospace, defense, and machine tools. Due to downsizing in all of these industries, and foreign competition from Germany and the Far East in the machine tool industry, employment in metalworking has been declining. In 1985, metalworking employed 61,000 people; today the industry employs less than 40,000. Large factories such as American Bosch in Springfield closed their doors during the most recent recession, and important customers such as United Technologies and General Dynamics have seen a drop in business due to reductions in federal defense spending. While most metalworkers have not folded, many are operating below capacity and with fewer workers. Subcontractors that are defense dependent are being challenged by both the drop in available work and lower margins in the remaining work due to new laws and pricing regulations.

Another end user of metalworking products is the plastics industry. Moldmaking shops serving the plastics industry specialize in complicated molds requiring sophisticated design capability. Shops work closely with plastics manufacturers concentrated in the Leominster, Fitchburg and Pittsfield areas developing high-quality, custom-made products. High-volume production of less complex molds for low-end plastic products takes place in Spain and Portugal, and the focus on quality and service has bolstered the reputation of Massachusetts metalworkers.

Firms producing fabricated metal products also serve the computer and electronics industry in the eastern part of the state and, recently, the medical equipment industry. The Machine Action Project estimates that as many as 15 percent of the shops located in Hampden County currently make products for the medical equipment industry, jointly working with health care facilities on the design and refining of new instruments. This trend towards customer diversification will continue due to anticipated declines in traditional sources of business, and the high precision and quality standards required by defense related customers and the medical instrument industry.

General Outlook

Building on its historical expertise in traditional manufacturing, the metalworking industry has been preparing for the future by incorporating new manufacturing technologies to improve its competitive advantage. Using state-of-the-art technologies such as CNC, CAD and CAM to further improve product quality, the majority of Massachusetts shops have been focusing on high precision metalworking and specialized products. Several firms in the Pioneer Valley have branched out into new, technology-based products with strong commercial potential.

With respect to the industry's workforce, there are many metalworkers who have been in the business a long time and have considerable useful knowledge and experience. However, with the upgrading of technology and machinery must come the upgrading of workers' skills. The skill sets necessary in the industry have been expanding dramatically, and industry sources claim that there is currently a shortage of trained machine operators with well-developed math, reading, problem solving and computer abilities. Older workers must be retrained to make the transition to the new technology or they will leave the business, taking their knowledge with them. The industry has recognized the issue, and training programs are being run by the Machine Action Project and the

National Tooling and Machining Association. Improving skills is crucial to accomplishing the product and market diversification that the metalworking industry needs to continue providing the high wage jobs within specific regions and in the Commonwealth as a whole.

TEXTILES AND APPAREL

Industry Composition

The textile and apparel industry is composed of firms involved in the manufacture of clothing as well as textile products with commercial, industrial, and medical end uses.

Significance to the State's Economic Base

In 1991, statewide employment within the textile/apparel industry was about 31,500, representing a 52 percent decline from the 1980 employment level of over 65,000. Average wages in the textile industry were $28,834 in 1991, while average apparel industry wages were considerably lower, at $18,455 (See Figure 8B). Wages in the industry represent 1.1 percent of total wages statewide.

As can be seen in Figure 8Q, employment is concentrated in the Southeast and Northeast regions of the Commonwealth. These regions are home to traditional centers of textile production such as New Bedford, Fall River, Lowell and Lawrence. Employment in these four cities accounts for nearly 51 percent of total employment in the industry statewide. Boston also has significant employment in the industry.

History

Textile and apparel manufacturing has a rich historical tradition in Massachusetts. Massachusetts and the New England region, drawing from their advantages in water power and technological supremacy, were once recognized as the world's apparel/textile capital. Within the past 75 years, competition from abroad and from low cost regions within the United States has eroded the region's competitive advantage in the industry. Employment has sharply declined over several decades, but the industry remains an important employer in certain parts of the Commonwealth.

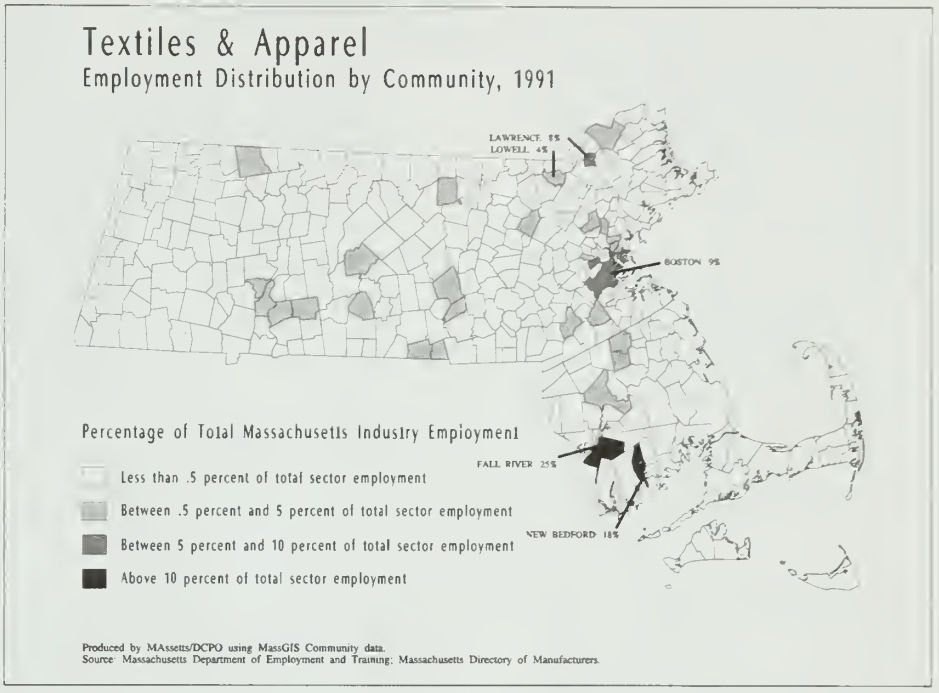

Textiles & Apparel
Employment Distribution by Community, 1991
LAWRENCE 8%
LOWELL 4%
BOSTON 9%
FALL RIVER 25%
NEW BEDFORD 18%
Percentage of Total Massachusetts Industry Employment
Less than .5 percent of total sector employment
Between .5 percent and 5 percent of total sector employment
Between 5 percent and 10 percent of total sector employment
Above 10 percent of total sector employment
Produced by MAssetts/DCPO using MassGIS Community data.
Source: Massachusetts Department of Employment and Training; Massachusetts Directory of Manufacturers.

Figure 8Q

Competitive Position

In the past decade Massachusetts textile and apparel manufacturers have continued to face severe competition. Massachusetts manufacturers must compete against foreign producers and with manufacturers in the southeastern United States which benefit from lower labor, utility, and business costs. U.S. apparel manufacturers have been especially hard hit by foreign manufacturers in cheap labor markets; over the past ten years apparel imports have nearly tripled.

Despite job losses within the industry in recent years, Massachusetts apparel and especially textile firms are very competitive in national markets. The Commonwealth's manufacturers have been forced to compete through advanced production processes and product specialization.

Textiles

Roughly 63 percent of textile manufacturing in the United States is for end uses other than apparel, ranging from automobile interiors, upholstery, and drapery to medical equipment, filtration devices and felt-tip pens. Massachusetts firms, drawing from a talented pool of skilled labor, are uniquely qualified to compete through the application of advanced technologies. Textile manufacturers within the Commonwealth tend to specialize in narrow niche markets. Examples include Globe Manufacturing Co. of Fall River which produces rubber thread and spandex fiber, Bacon Felt of Taunton which produces felt to be used in a variety of medical and industrial applications, and Malden Mills Industries in Lawrence which produces "Polartec", a high-performance, insulating fabric.

Apparel

The apparel industry is extremely labor intensive. Thus, Massachusetts apparel manufacturers cannot compete successfully with foreign competition employing cheap labor in the market for mass produced, low quality apparel. This, combined with the fact that apparel is an extremely price sensitive end product, has caused Massachusetts to lose its competitive advantage to regions of the U.S. and foreign countries with lower labor costs. Some Massachusetts firms are, however, able to compete in niche markets that emphasize

high quality design and manufacturing. These manufacturers are reliant upon highly skilled, rather than low cost labor. Manufacturers of high-end, fashion apparel tend to concentrate in the production of small lot, design intensive rather than production-intensive products. Successful firms have been those which are able to respond quickly to changes in higher quality fashion trends. An emphasis therefore, is placed upon production flexibility, efficiency, and a highly skilled workforce. Many apparel firms in the Commonwealth have invested heavily in recent years in worker training programs and upgrading of production machinery in order to improve productivity and quality.

Need for Skilled Labor

Despite competitive wages, long term employment losses in the textile/apparel industry has served to dissuade skilled labor from entering the industry. Poor marketing of opportunities within the industry has led to a shortage of students entering the fields of textile technology and chemistry. In the words of Frederick Satkin, President of Satkin Mills Inc. of New Bedford: "We suffer from the "Norma Rae" syndrome...our need is to publicize the fact that textile manufacturing jobs are critical to the economy of the state."

Supporting the textile industry is the Textile Science Program at the University of Massachusetts at Dartmouth, the only such program in New England. The program is responsible for the training of textile chemists and engineers, and skilled workers in dyeing and finishing. Over 90 percent of program graduates are placed in New England firms, whether at major textile manufacturers, at the many smaller niche manufacturers or within the testing and R&D departments of major retail manufacturers such as Talbots and Reebok.

Supporting the apparel industry is the Southeastern Massachusetts Sewn Products Association, a network of apparel manufacturers in southeastern Massachusetts which is involved in the transfer of technology and identification of training needs in the industry.

Promoting Exports

Massachusetts firms may be able to gain market share in foreign markets for high fashion apparel and high-technology niche products. The Northern Textile Association, a Boston-based trade association of textile manufacturers, has recently established the Northern Textile Export Trading Company. This entity will act on behalf of member firms to negotiate in joint bidding and selling and engage in joint promotional activities.

General Outlook

The Commonwealth's textile and apparel industries are poised to take advantage of markets for high end, high technology products. Both industries are continuing to upgrade their technology and improve efficiency. Both industries have moved toward computer-aided design and production, thus leading to the production of higher value-added products and higher wages. These improvements in production efficiency should allow the industry to prevent further employment losses. Future employment growth in the industry is dependent upon the ability of Massachusetts firms to expand export markets.

INDUSTRIAL AND ELECTRICAL MACHINERY

Industry Composition

The industrial and electrical machinery and equipment industry is one of the oldest and largest employers in the Commonwealth. Products developed within the industry include plastic and metal forming and cutting machines as well as a wide variety of other products including tool and dies, pumps and pumping equipment, and air and gas compressors.

Significance to the State's Base Economy

Employment in the industry in 1991 was 53,720 and average wages were $33,750. Annual payroll in the industry represents 2.7 percent of the Commonwealth's total private sector payroll (See Figure 8B). The industry provides machinery to support other key industries in the Commonwealth such as plastics, paper, textiles and fabricated metals.

As can be seen in Figure 8R, employment in the industrial machinery industry is scattered throughout the state. Significant concentrations of employment are in the cities of Attleboro, Wilmington, Worcester, and the Springfield area.

Competitive Position

Plastics Machinery. Supporting the state's plastics industry are firms that manufacture machinery used for plastics cutting, forming and molding. The Commonwealth is home to Nelmor, the largest manufacturer of plastics granulators in the U.S. In addition, Massachusetts is the U.S headquarters of three of the leaders in the production of blown film production equipment. The Commonwealth is also home to several manufacturers of robots for plastics applications including Martin Industries of Agawam, a 120-employee manufacturer of robotic arms used in the plastics injection molding production process. Retooling within the plastics machinery industry has allowed manufacturers to offer more efficient, flexible, multiple-use machinery in order to satisfy the diverse needs of plastics producers.

Paper Machinery. The industrial machinery industry supports the state's paper industry through the production of such products as pulping and refining equipment, screening equipment, and slitting and rewinding equipment. Major employers in the paper machinery industry include the Entwistle Corporation of Hudson, which employs over 300 in the production of paper converting equipment, and the Beloit Corporation of Dalton, which employs 450 people in the production of pulping and refining equipment. Manufacturers have been engaged in an aggressive investment strategy in recent years to improve productivity and quality. To an increasing extent, Massachusetts' manufacturers have been able to tap into foreign

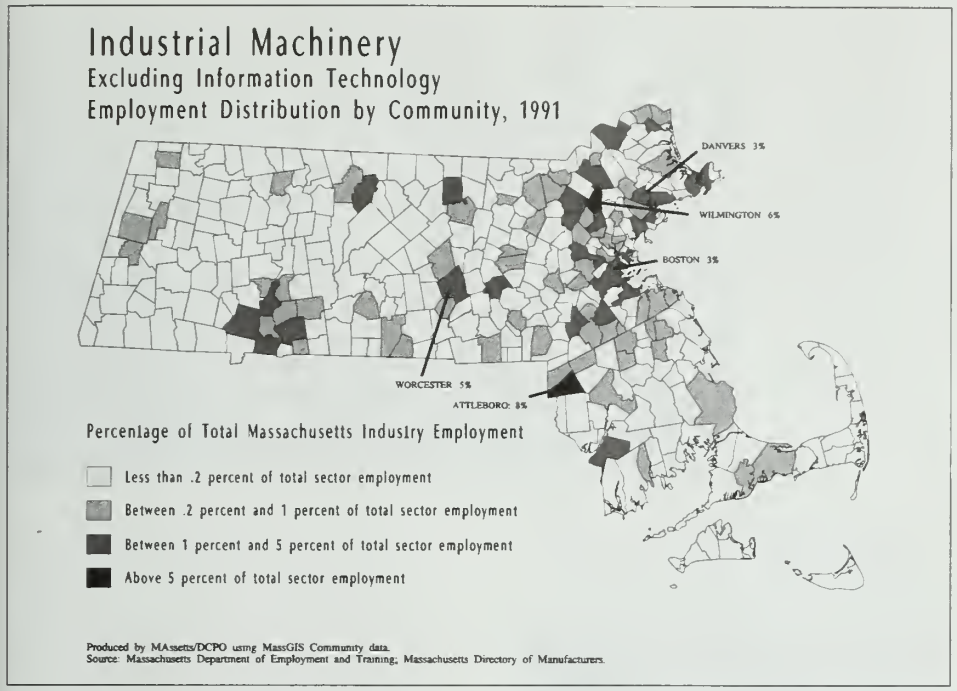

Industrial Machinery
Excluding Information Technology
Employment Distribution by Community, 1991
DANVERS 3%
WILMINGTON 6%
BOSTON 3%
WORCESTER 5%
ATTLEBORO: 8%
Percentage of Total Massachusetts Industry Employment
Less than .2 percent of total sector employment
Between .2 percent and 1 percent of total sector employment
Between 1 percent and 5 percent of total sector employment
Above 5 percent of total sector employment
Produced by MAssetts/DCPO using MassGIS Community data.
Source: Massachusetts Department of Employment and Training; Massachusetts Directory of Manufacturers.

Figure 8R

markets. For example, over 40 percent of Beloit Corporation's sales are to foreign firms.

Metalworking Machinery. Within the industry, there is a concentration of firms which focus on metal cutting and metal forming machine tools. Worcester County has the highest concentration of firms involved in metalworking machinery with 27 percent of such firms statewide located there. Firms within the industry manufacture a wide variety of products such as tool and dies, grinding machines and machine tool parts.

General Outlook

Taken as a whole, the industrial machinery industry is currently in the midst of major restructuring. Investment tax credits proposed at both the state and federal level may lead to increased investment. This investment will likely be centered on upgrading technology and improving competitiveness rather than adding capacity. The movement of Massachusetts industrial machinery producers towards more efficient, flexible, multi-use machinery could position the industry against future employment declines.

TOURISM

Industry Composition

The tourism trade is made up of many component parts. It includes economic activity generated from direct "tourist attractions" as well as from retail trade, hotel services, entertainment services, and eating and drinking places.

Significance to the State's Base Economy

The importance of tourism to the Commonwealth's economy can not be overstated. Tourism is an "export", or base, industry in that it is responsible for the inflow of wealth from outside the State. It is estimated by the U.S. Travel Data Center that travelers to Massachusetts were responsible for nearly $10.5 billion in economic activity in 1990. In 1990, nearly $1.6 billion in payroll incomes or earnings were directly generated by traveler spending. In short, traveler spending in Massachusetts creates jobs; it is estimated that in 1990 the direct and indirect impact of travel spending was the maintenance of nearly 164,000 jobs in the Commonwealth.

Competitive Position

Massachusetts has long been recognized for its natural beauty and cultural and historical attractions. As the birthplace of the nation, the Commonwealth attracts thousands of visitors each year to its many historical sites. In addition, visitors enjoy the state's many miles of beaches, sports and entertainment events, beautiful forests, hills and farm lands, and charming New England villages. Tourism is a statewide, year-round industry in Massachusetts. Nationally and internationally recognized attractions exist throughout the Commonwealth, from the Freedom Trail in Boston and the beaches of the Cape, to the Lowell National Historical Park, Springfield's Basketball Hall of Fame, and the Boston Symphony Orchestra's summer home at Tanglewood.

Regional Concentration

The importance of tourism varies by region. The Greater Boston area ranked first in travel expenditures with $4.6 billion in 1990. However, the Cape and Islands Region with over $490 million in expenditures and Berkshire County with over $101 million are far more dependent on tourism for their economic base. The Cape and Islands Region's population is estimated to triple during the summer months, exceeding half a million with the influx of summer residents and visitors. The Cape Cod National Seashore estimates over 5 million visits to its sites annually. Meanwhile, between 1 and 1.5 million visitors are estimated to visit the attractions of the Berkshires each year.

Seasonal and Recessional Patterns

The tourism industry is especially susceptible to fluctuations in the national economy. The effect of the national recession has been a decrease in overnight trips to the Commonwealth. Tourism is also subject to seasonal fluctuations, with over 52 percent of all trips to Massachusetts made in the summer months in 1990. This percentage is much higher in the beach resort areas of the Cape and Islands.

Massachusetts Industry Profiles

Long-term growth in the tourism industry will be dependent upon the Commonwealth's ability to increase year-round tourism activities through the creation and successful marketing of cultural attractions. Massachusetts, due to its abundance of "ready made" tourist attractions in the form of natural resources and historical sites from the Colonial and Revolutionary War period, has an obvious competitive advantage over other states in its ability to attract visitors. However, there is currently a movement in the industry towards more "high value added" attractions in the form of resorts and cultural attractions such as museums. An example is the proposed Mass MOCA project in North Adams, which aspires to be the world's largest collection of contemporary art.

Another area of year-round tourism trade comes in the form of business/convention travel. An estimated 16.9 million trips were taken by U.S. residents to Massachusetts during 1990; of these, 19 percent came as a result of business/convention travel. Massachusetts can increase its share of business travel nationally through increased marketing of its convention resources. The construction of a proposed convention megaplex would place Massachusetts in a much stronger competitive position with other popular convention centers nationally, allowing the city to host the nation's largest conventions which it is now forced to turn away.

Marketing Massachusetts

The interests of the Commonwealth's tourism industry are currently being addressed through the marketing efforts of the Massachusetts Office of Travel and Tourism (MOTT). Currently, Massachusetts draws most of its international tourism trade from the United Kingdom, France, Germany and Japan. Massachusetts can expand its markets in these countries as well as develop new markets throughout Europe through more aggressive marketing. MOTT is stepping up its international marketing programs through joint ventures with major airlines and the creation of foreign language promotional videos and literature.

Massachusetts' unique charm and wealth of natural and cultural resources attract millions of visitors to the state every year. *Photo of Rockport courtesy of Massachusetts Office of Travel and Tourism.*

POTENTIAL FUTURE GROWTH INDUSTRIES

Earlier chapters of this Strategy have argued that productivity improvements throughout the state's existing economic base are necessary to stabilize employment and sustain a high relative standard of living. The challenge facing many of Massachusetts' existing businesses is one of survival through productivity gains in an increasingly competitive global market. While some established businesses in traditional industries can add jobs through new product development or increased exports, a significant part of the state's hope for new job growth lies with young companies capable of rapid innovation, particularly in emerging technologies.

Businesses in the Commonwealth have a significant lead in some of these emerging technologies. In others, they are locked in a battle for competitive advantage with clusters of businesses in other parts of the nation and world. In still others, Massachusetts firms are a presence, but are still far from a position of dominance.

The capacity to innovate remains the key competitive advantage of many Massachusetts firms, bolstered by the state's concentration of education and research resources, skilled labor pool, and the presence of other innovative firms.

The following identifies some business sectors to watch in Massachusetts. The discussion is fundamentally subjective. No hard data exist that can offer a reliable method of predicting the future. Whether a given emerging technology sector prospers in Massachusetts depends very much on the continued presence or absence in the state of factors essential to its growth, as well as unpredictable contingencies in world markets and in the process of technology development itself. Nevertheless, it should be clear that Massachusetts is blessed with the presence of a number of businesses in sectors promising for future job growth. At least some of these businesses will have to perform well if Massachusetts is to see resumed growth and significantly lower unemployment in the near-term.

The list that follows is also, inevitably, incomplete. The most promising new technology in the state may well be in a laboratory or garage — or simply in someone's head — and not yet visible publicly. Promising sectors are presented in alphabetical order:

Advanced Manufacturing Technology. Advanced manufacturing processes are a vital part of the nation's industrial competitiveness. While mechanized assembly lines yielding huge volumes of low-cost products represented the key to success in the past, the future belongs to a different form of manufacturing: flexible production using concurrent engineering to produce custom-designed products for niche markets. Parts

of this new system are being created in Massachusetts. For example, the University of Massachusetts at Lowell is doing research in advanced manufacturing techniques through its Center For Industrial Competitiveness. The presence in Massachusetts of strong information technology and software industries, advanced research institutions, and traditional manufacturers makes the field of advanced manufacturing technology one to watch for the Commonwealth.

Advanced Materials. Advances in materials have always played a defining role in technological progress, and this will be even more true in the future, as the commodities that built America (like steel and silicon) are replaced by "designer" materials created to give exceptional performance in specific jobs. Materials research is proceeding at Massachusetts universities and companies in a variety of directions, including plastics, metals, composites, biomaterials, electronic materials and ceramics. This research will yield innovations that will add to the Commonwealth's industrial competitiveness. Examples include super-strong yet lightweight alloys for vehicles, flexible ceramics that withstand the highest temperatures for use in engines, artificial human bones and tissue, faster computers through improvements in metals, ceramics and polymers used for computer chip packaging, and superconducting ceramics used in such technologies as magnetic levitation trains.

Biotechnology. A decade's worth of research and new product development has already yielded phenomenal results in medical biotechnology, with a promise of much more to come: more than 100 new medical products are now in advanced development, many in Massachusetts laboratories. In the 1990s, other fields of biotechnology may also take center stage. These include genetically altered plants, drugs, vaccines and diagnostic tests for the veterinary market, biopesticides and other chemicals, and bioremediation (i.e. using bacteria and other approaches to clean up pollution and toxic waste). By the year 2000, $100 billion worth of biotech drugs, plants, chemicals and other products could be sold worldwide. The power of recombinant technologies offers the prospect that the industry will continue to develop revolutionary new products. Growing world affluence — and the aging of populations in the most affluent countries — indicates continued strong world demand for biopharmaceuticals and other advanced health care products. The universities, hospitals and research centers in the Greater Boston and the Central regions, combined with a strong existing industry cluster, should continue to fuel the industry's growth in Massachusetts.

Educational Technology. Massachusetts' leadership in developing information and communications technologies has just begun to be applied to education, where it can greatly assist in the delivery of programs and services. The promise of educational technology has only begun to be explored. However, it is clear that traditional text and classroom methods of learning can be supplemented, particularly for a video-oriented generation comfortable in interacting with computers. Massachusetts defense contractors have pioneered new training methods that have allowed relatively unskilled recruits to master complex, high-technology systems. These technologies can be applied to earlier learning. Telecommunications can play an important role as well. In the future, there could be a statewide electronic network that would connect educational institutions at all levels, linking classrooms, libraries, laboratories, workshops and conference rooms. Technologies that could be used to link existing educational networks and create new networks include fiber optics, satellite, cable television, and public telephone-switched networks.

Environmental Technology. Massachusetts is home to some of the most innovative and sophisticated energy and environmental companies in the world, providing a wide variety of products and services. New technologies are being developed by over 1,300 Massachusetts-based companies to conserve energy, produce alternative energy, prevent and reduce pollution, and facilitate recycling and hazardous waste disposal. A number of research institutes connected with public and private universities throughout the state conduct innovative energy and environmental research. New firms are continually being spun off from local universities as well as existing firms. The need to bring Massachusetts into compliance with the Clean Air Act offers opportunities in the production of electric vehicles and emissions monitoring devices. Demand for the products and services of this sector can be expected to grow rapidly, driven by world awareness of the cost of pollution and a growing worldwide commitment to a clean environment. Massachusetts appears well positioned to assume a leading role.

High Performance Computing. The high performance computing (HPC) market covers a broad array of technologies, including supercomputers, high-performance mini computers and mainframes, mini-supercomputers, and massively parallel systems. Their speed and the huge number of calculations they are capable of performing simultaneously has made them most useful in science and engineering applications. As their cost drops, they are finding an increasing number of commercial applications. Massachusetts has a decided advantage in HPC, due to its status as a center for research, education and industry related to computing and information technologies. Several of the world's leading HPC companies are situated in Massachusetts, particularly in the massively parallel field. Research centers like the Worcester Polytechnic Institute's Center for High Performance Computing are providing technology transfer to businesses. The University of Massachusetts' Computer Science Department at Amherst is pioneering advanced software to make use of high performance computers to solve such problems as cost-effectively managing the nation's medical insurance system.

Marine Science. Marine electronic instrumentation is a rapidly developing area of high technology. Products such as sensors, storage and analysis systems, communication and navigation instruments and advanced military electronics are crucial to a wide

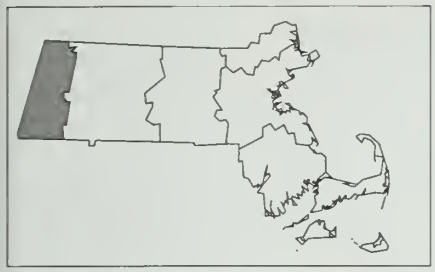
range of activities. Undersea defense, offshore oil and gas production, oceanographic research, environmental monitoring, and commercial and recreational fishing all use products made by the 56 firms in the Commonwealth specializing in marine electronics and instrumentation. Many of these firms are spin-offs from several marine research institutions located in southeastern Massachusetts, including the Woods Hole Oceanographic Institution and the Marine Biological Laboratory.

Software. A key competitive advantage for Massachusetts' software industry is its history of innovation and creativity. The personal computer software industry began here with the development of VisiCalc, and today, the Commonwealth's software designers and engineers are working on the leading edges of artificial intelligence, voice recognition, advanced robotics and defense-related software applications. The Computer Science Department at the University of Massachusetts at Amherst is one of only two National Centers of Excellence in Artificial Intelligence for the U.S. Department of Defense. In addition, its National Center for Intelligent Information Retrieval (NCIIR) has tremendous licensing potential within many information-based industries for automatic analysis of and retrieval from very large quantities of text.

Telecommunications Technology. Massachusetts telecommunications firms provide hardware, software and services for both voice and data communications. While the voice market is currently the largest, the rapidly growing data communications market holds great potential. Numerous start-up companies and established systems suppliers are making the complex electronic boards and specialized connecting systems that are part of internetworking equipment. This equipment will allow companies to connect their small, disparate computer and local networks into larger networks. Massachusetts is a world leader in developing these products. Other new markets in telecommunications technology in which Massachusetts companies are involved include voice mail, video teleconferencing and voice and data integration. The promise of telecommunications lies in the successful integration of computers and communication technologies to substantially increase productivity in a wide variety of business sectors. Massachusetts already has the nation's largest concentration of telecommunications businesses and is poised to lead this industry.

Transportation Technology. The passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) in 1991 and the Clean Air Act in 1990 will yield new opportunities in transportation-related technology. Specifically, ISTEA shifts the focus of transportation policy away from interstate highways and onto a variety of methods of moving people and goods. ISTEA puts money into sophisticated technologies such as Intelligent Vehicle and Highway Systems and high-speed magnetic levitation trains, which might be feasible in the Boston/New York and Boston/Albany corridors. Performance improvements may manifest themselves in the form of more efficient modes of transportation, and the application of information technology to improve vehicle flow. Defense companies, given their experience both with high technology and complex systems, may find advanced transportation technology a useful sector for conversion opportunities.

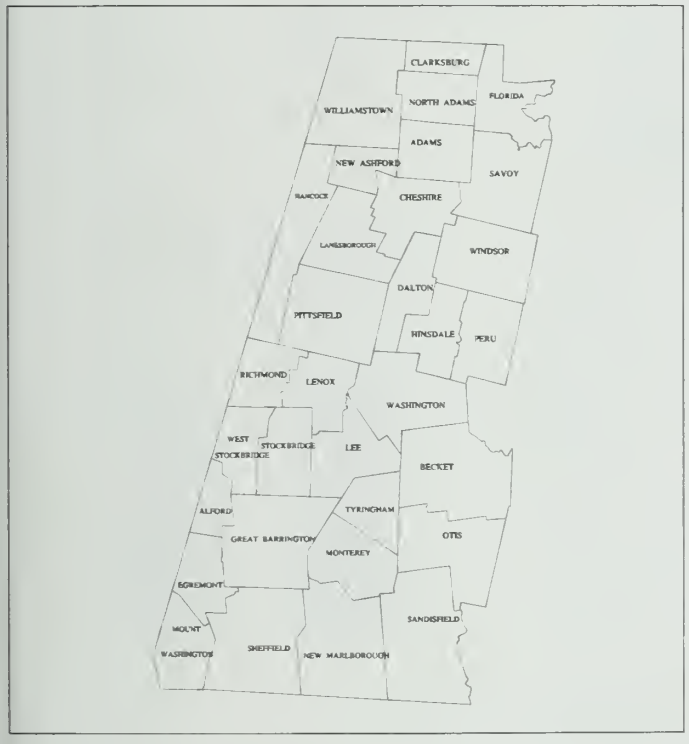
Chapter 9 Berkshire Regional Profile



CHARACTERISTICS OF THE REGION

Geographic Description

Berkshire County is the westernmost region of Massachusetts. It borders New York State to the west, Vermont to the north and Connecticut to the south. Pittsfield and its surrounding communities constitute the region's largest urban and economic center with 58 percent of the county's population and 65 percent of its total employment. Pittsfield lies 137 miles from Boston and 142 miles from New York City. The city of North Adams and the towns of Adams, Williamstown and Great Barrington form the region's other main population and economic centers. In all, Berkshire County consists of 32 cities and towns.



Economic Overview

The Berkshire Region has traditionally had a higher concentration of durable goods manufacturing than the state average. Beginning in the growth years of the mid-1980s, however, the Berkshire County economy has undergone a significant restructuring (See Figure 9A). Although Pittsfield still ranked among the top 25 percent of metropolitan areas nationwide with respect to manufacturing concentration in 1988, manufacturing has come to play a smaller role in the region while service-producing sectors have expanded. As illustrated by Figure 9B, manufacturing's share of total employment in the county fell from just under 30 percent to roughly 20 percent between 1983 and 1991. Service companies have concurrently boosted their employment shares from 25.7 percent to 32.3 percent. Within the manufacturing sector, nondurable goods production has become increasingly important, increasing its share of employment steadily from 33 percent to 45 percent.

These long-term trends have been driven by noteworthy shifts in the relative performance of the region's major industrial clusters. Strong growth in nondurable industries such as plastics, chemicals, and paper goods production accounts for much of the gain in that area. The decreased weapons production at GE Aerospace and the dismantling of electronics manufacturing industries such as Sprague in the North

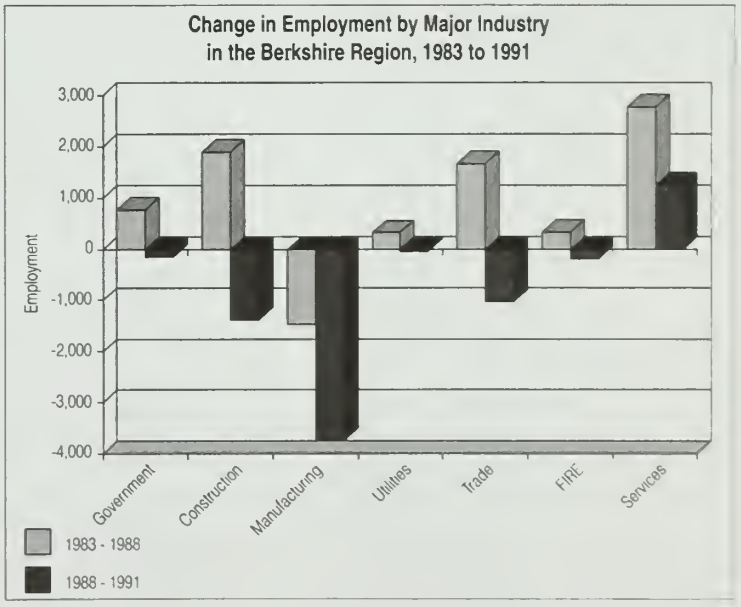


Figure 9A

Berkshire Region Employment Shares by Major Industry 1983 - 1991

Industry	1983	1988	1991
Government	9.9%	10.1%	10.8%
Construction	3.2%	5.9%	4.0%
Manufacturing	29.5%	24.1%	19.7%
Utilities	2.8%	3.0%	3.2%
Trade	24.1%	24.2%	24.7%
FIRE	4.3%	4.4%	4.5%
Services	25.7%	27.5%	32.3%
Total Employment	100.0%	100.0%	100.0%

Figure 9B

County explains much of the shift away from durable manufacturing. One major exception to this overall trend in durable manufacturing has been the paper machinery industry, which posted impressive growth prior to the recession and appears well placed for future growth. In services, the health care industry has grown to play a sizable role in the regional economy, while tourist-related services have expanded as well.

The long-term shift away from durable manufacturing and toward nondurables and services has had, and continues to have, a significant effect upon Berkshire labor markets. In particular, these changes have significantly altered the regional labor force's occupational composition (See Figure 9C). This has led to a mismatch between the skills sought by expanding nondurable and service sectors of the economy and those possessed by workers laid off from durable manufacturing. By moving a large proportion of the labor force from high wage industry sectors to lower paid ones, this structural shift has also exerted downward pressure on wage growth in the region.

Recent economic growth in the region has not been strong when compared with other parts of the Commonwealth. Between 1983 and 1987, average annual employment in the Berkshire Region increased by only 1.5 percent. This was substantially lower than the statewide average increase of 7.7 percent and the 9.7 percent increase shown in the Metropolitan Boston area. Unemployment has also consistently

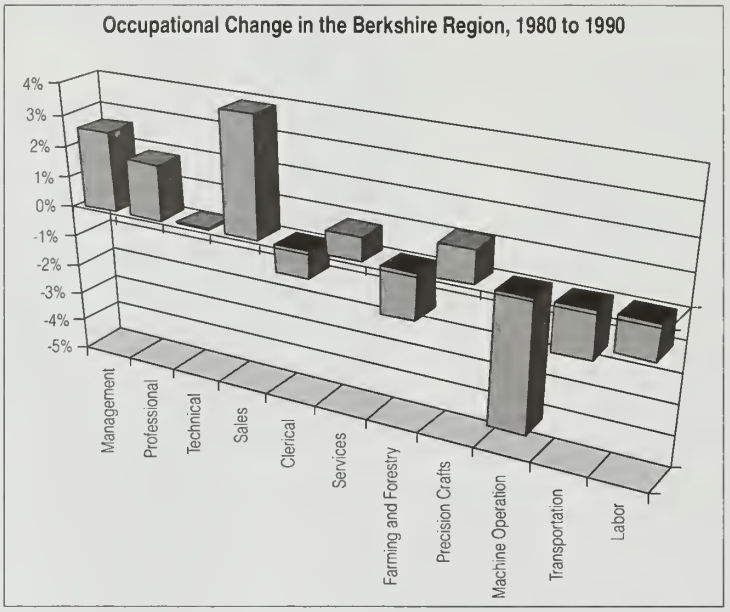


Figure 9C

exceeded state averages, as illustrated in Figure 9D. A large part of the explanation for this is that the Berkshire Region has very few of the information technology and biotechnology firms which generated a substantial share of the growth seen elsewhere in the state over the past decade. Despite the fact that the Massachusetts "boom" of the 1980s largely passed the Berkshires by, many of the region's base industries show considerable strength and potential. Although still based in traditional industries, a number of firms have found niche markets and have developed production processes which make them viable vehicles for long-term growth.

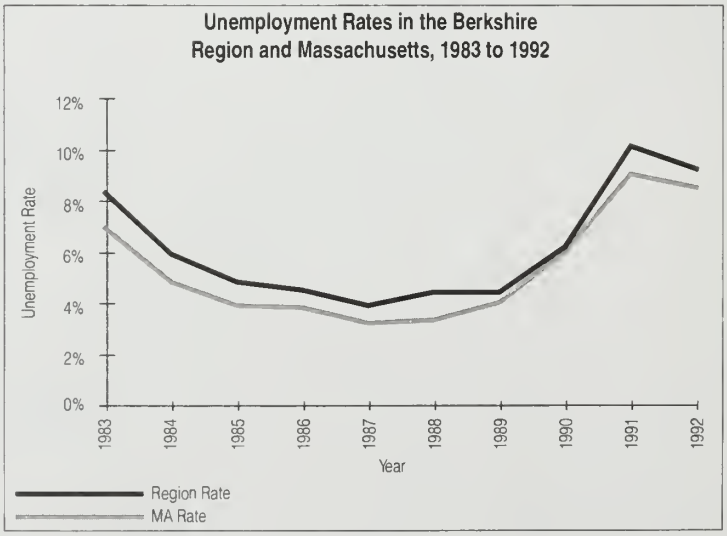


Figure 9D

Population Characteristics

In 1990, Berkshire County was home to 139,352 people. This marked a 4 percent drop from 1980, which was primarily due to outmigration. Berkshire was the only county in the Commonwealth to lose population during this period, reflecting the fact that the Massachusetts employment boom of the 1980s had an unusually small impact upon the region. Provisional population projections from the Massachusetts Institute of Social and Economic Research indicate that this trend is likely to continue with a further 2.6 percent decline by 1995. In addition to getting somewhat smaller, the population of the Berkshires grew older during the 1980s. This shift is reflected in the approximately 20 percent decline in the number of people aged 5-24 and the concurrent 35.6 percent increase in the proportion of the regional population aged 35-44. The residents of the Berkshires are 96.3 percent white with small but expanding black, Hispanic, and Asian populations.

The region's educational attainment levels lie somewhat below the state averages. Nearly 78 percent

of Berkshire residents over the age of 25 have a high school degree, compared to the 80 percent statewide average. Also significant is the fact that only 20.9 percent of the Berkshire population has a bachelor's degree or higher, compared to 27.2 percent statewide. Education attainment levels did improve, however, over the 1980 to 1990 period, as shown in Figure 9E. In 1989, per capita income in Berkshire County was $14,857. This figure is 13.7 percent below the statewide per capita income for that year of $17,224. Average unemployment for the first three quarters of 1992 was 9.4 percent — marking a 1.2 percent improvement from 1991 levels. Average employment for the first three quarters of 1992 was 66,261.

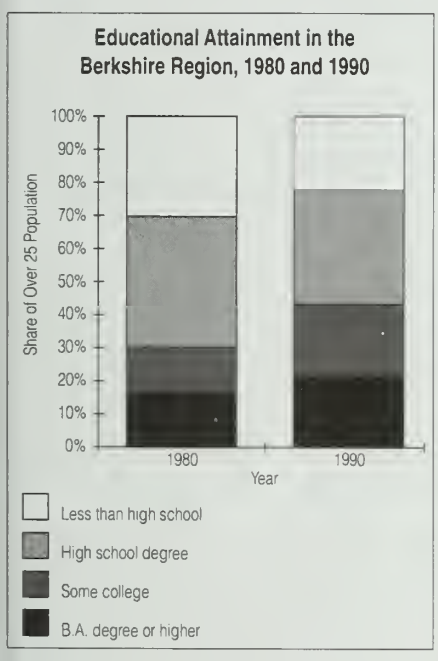


Figure 9E

Income statistics indicate that there is considerable economic variation within the Berkshire Region (See Figure 9F). There is a particularly large difference between conditions in the north of the county and those found in central and southern towns. Northern parts of the county have been particularly hard hit by electronics industry layoffs while southern areas have fared remarkably well through the recession.

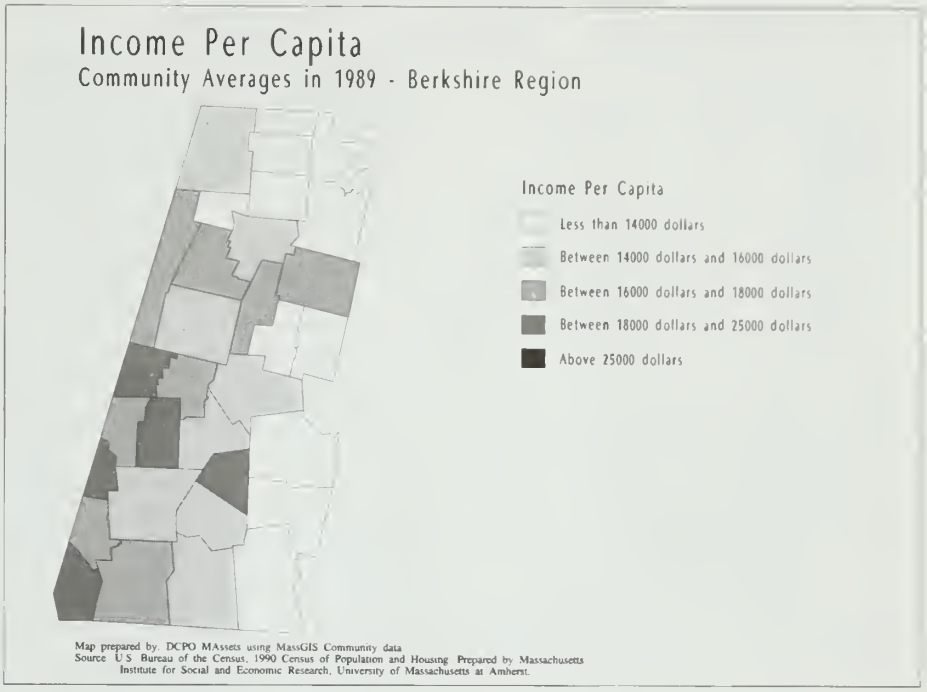

Income Per Capita
Community Averages in 1989 - Berkshire Region
Income Per Capita
Less than 14000 dollars
Between 14000 dollars and 16000 dollars
Between 16000 dollars and 18000 dollars
Between 18000 dollars and 25000 dollars
Above 25000 dollars
Map prepared by: DCPO MAssets using MassGIS Community data
Source: U.S. Bureau of the Census, 1990 Census of Population and Housing. Prepared by Massachusetts Institute for Social and Economic Research, University of Massachusetts at Amherst.

Figure 9F

INDUSTRY AND EMPLOYMENT TRENDS

Critical Industries

Critical industries in the region include plastics and chemicals, paper products and machinery, defense, and tourism. The plastics and paper-related industries are highly attractive for the long-term economic development of the Berkshires. The primary reason for this is that they are both sectors with high projected growth and established bases in the region. The plastics and paper-related industries are also characterized by a high concentration of skilled workers, machine operators and engineers. These are exactly the kinds of high wage, high value-added jobs which the county needs to raise per capita income and standards of living. The technological and skill thresholds are high and, therefore, consistent with a local desire to upgrade workforce skills and absorb the large numbers of skilled workers laid off by GE, Sprague and others.

Although the fabricated metals industry remains a vital component of the Berkshire economy, long-term structural problems linked to defense spending cuts make the development prospects in this industry more uncertain. The industry is not projected to supply significant new output or employment growth and is, therefore, unlikely to play a central role in attaining regional development goals.

While many of the jobs associated with tourism are not ideal for long-term skill development and earnings growth, they are a valuable source of secondary income and experience for new labor market participants. Tourism is also a sector which can be conducive to the development of small business start-ups. The region's industry employment statistics are summarized in Figure 9G.

Industry Profiles

Plastics and Chemicals

The plastics and chemicals industry has traditionally supplied a large proportion of the region's high wage jobs. GE Plastics, in particular, ranks among the region's largest corporate entities and employers. In addition to GE's polymer and process development facilities, the industry has some 38 smaller custom molders, custom and proprietary mold builders, mold designers, testing labs and

BERKSHIRE REGION
EMPLOYMENT BY MAJOR INDUSTRY
1988 Fourth Quarter - 1991 Fourth Quarter

INDUSTRY	EMPLOYMENT CHANGE 1988-1991 FOURTH QUARTER 1988	1991	NET CHANGE	PERCENT CHANGE	PERCENT OF 1991 TOTAL EMPLOYMENT
TOTAL EMPLOYMENT	63,170	56,140	(7,030)	-11.1%	100.0%
TOTAL PRIVATE EMPLOYMENT	56,500	49,730	(6,770)	-12.0%	88.6%
AGRICULTURE, FORESTRY, & FISHING	340	370	30	8.8%	0.7%
MINING	110	90	(20)	-18.2%	0.2%
CONSTRUCTION	3,770	2,130	(1,640)	-43.5%	3.8%
Special Trade Contactors	2,070	1,220	(850)	-41.1%	2.2%
MANUFACTURING	14,820	10,960	(3,860)	-26.0%	19.5%
Paper & Allied Products	2,200	1,890	(310)	-14.1%	3.4%
Printing & Publishing	1,100	960	(140)	-12.7%	1.7%
Plastics & Chemicals	2,030	1,780	(250)	-24.7%	3.2%
Industrial Machinery & Equipment	1,300	1,140	(160)	-12.3%	2.0%
Electronic & Other Electrical Equipment	1,690	560	(1,130)	-66.9%	1.0%
TRANSPORTATION & PUBLIC UTILITIES	1,960	1,800	(160)	-8.2%	3.2%
WHOLESALE TRADE	1,520	1,580	60	3.9%	2.8%
Wholesale Trade Nondurable Goods	690	820	130	18.8%	1.5%
RETAIL TRADE	14,150	12,320	(1,830)	-12.9%	21.9%
General Merchandise Stores	1,480	1,220	(260)	-17.6%	2.2%
Food Stores	2,130	2,080	(50)	-2.3%	3.7%
Automotive Dealers & Service Stations	1,190	990	(200)	-16.8%	1.8%
Apparel & Accessories	1,000	930	(70)	-7.0%	1.7%
Eating & Drinking	4,370	3,740	(630)	-14.4%	6.7%
Misc. Retail	2,900	2,590	(310)	-10.7%	4.6%
FINANCE, INSURANCE & REAL ESTATE	2,480	2,570	90	3.6%	4.6%
Depository Institutions	1,150	1,060	(90)	-7.8%	1.9%
Insurance Carriers	540	710	170	31.5%	1.3%
SERVICES	17,360	17,920	560	3.2%	31.9%
Hotels & Other Lodging Places	1,420	1,300	(120)	-8.5%	2.3%
Personal Services	740	1,080	340	45.9%	1.9%
Business Services	1,490	1,130	(360)	-24.2%	2.0%
Amusement & Recreation	800	650	(150)	-18.8%	1.2%
Health Services (private)	6,160	6,710	550	8.9%	12.0%
Educational Services (private)	2,310	2,490	180	7.8%	4.4%
Social Services	1,760	1,470	(290)	-16.5%	2.6%
Engineering & Management	820	1,100	280	34.1%	2.0%
GOVERNMENT	6,680	6,410	(270)	-4.0%	11.4%
FEDERAL	600	610	10	1.7%	1.1%
STATE	750	670	(80)	-10.7%	1.2%
Educational Services	480	430	(50)	-10.4%	0.8%
LOCAL	5,320	5,130	(190)	-3.6%	9.1%
Educational Services	3,330	3,360	30	0.9%	6.0%

SOURCE:Massachusetts Department of Employment and Training, Employment and Wages/ES-202.
NOTES:Data represent jobs covered by Unemployment Insurance laws. Data are not adjusted for non-economic changes in industry or geographic coding that may have occurred between the comparative periods. C= CONFIDENTIAL DATA.

Figure 9G

polishers. Together, these companies constitute an industrial cluster with approximately 1,800 employees and 3.5 percent of total private employment. There are extensive positive interrelationships at work within this cluster. One example of this dynamic is reflected by the fact that local molders and mold builders derive much of their business from clients who buy their plastics from GE. This creates further cluster interaction because the production process requires considerable cooperation between the developer and molder. There are also extensive relationships between local mold builders and heat testing and polishing firms. Overflow contracting among molders and mold builders is a common practice as well.

Berkshire County's plastics and chemicals industry experienced strong growth through the 1980s and was one of the few manufacturing industries to make significant employment gains. Slow demand in major product areas such as automobiles, computers, and construction over the past three years, however, have forced some downsizing. Total industry employment fell by 10.1 percent between 1990 and 1991, due largely to layoffs at GE Plastics and Chemicals. As a whole, however, the industry is weathering the recession fairly well, and the long-term outlook is positive. Pfizer, an inorganic chemical manufacturer and major employer in the region, has decided to expand its local operations and actually posted a modest employment gain between 1990 and 1991. The smaller mold builders and molders have also been doing well in relative terms. In 1991, these firms posted a modest 4.6 percent drop in employment — outperforming the entire private sector, which showed a 7.4 percent reduction in employment. The U.S. Department of Labor projects plastic and composite output to grow nationally as these products continue to substitute for metal and glass. Industry demand is expected to pick up as the recession eases, and industry analysts expect solid performance by both GE and the smaller firms in the cluster. Particular enthusiasm is shown for a few small firms engaged in niche production in specialized processes and the use of recycled plastics.

One very promising development in the plastics industry has been the creation of a formal plastics industry network. Thirty-six small molding and mold building firms, in conjunction with GE, have joined forces to create a single marketing and development effort. With the aid of a $200,000 state grant, the network has hired a full-time office manager. The network's focus is on acquiring market and product information and setting up a series of plastics seminars which will ultimately finance the network's operations. GE has loaned the network one of its top marketing executives to develop these seminars and to construct an overall marketing program for the network's participants. The network members have access to GE's world-class research and process facilities. They also are expected to have access to GE's library facilities, market analysis and mailing lists. A number of the network's members are also involved in a broad array of low cost cooperative consulting services. Services have been brokered from the University of Massachusetts at Amherst, Rensselaer Polytechnic Institute and Bay State Skills Corporation to pursue statistical process control systems, ISO 9000 training, waste reduction programs, and software design and development.

Paper Products and Machinery

The paper products and paper machinery industries constitute one of the Berkshire Region's oldest industrial concentrations. In 1991, 2,775 people (5.4 percent of total private employment) were employed by companies which fall under this heading.

Paper production — led by firms such as Crane and Kimberly-Clark — has proved to be one of the regional economy's strongest performers over the past several years. Between 1986 and 1988, the industry averaged an annual job growth of approximately 4.0 percent. The national recession interrupted this growth pattern temporarily but has not caused extensive problems. In 1991, the industry posted a very small job loss of 0.6 percent despite conditions which forced extensive cutbacks in other industries. Paper demand is expected to rise in the coming years and to fuel further growth among Berkshire firms. Much of the local industry's past success and future potential stem from the fact that it is characterized by a number of firms with successful market niches in specialty areas such as magazine and high quality writing paper. Many Berkshire firms have invested aggressively in new equipment and capacity. In addition to having retained most of their skilled workforces through the recession, a number of firms have initiated programs to upgrade workforce skills. These steps will improve productivity and enhance product quality, thus preserving competitiveness over the long-term. Downstream producers of laminated and converted paper such as Mead are also expected to do well.

Throughout the 1980s, the paper machinery industry was one of the few durable goods industries that generated significant job growth. Beginning in 1990, however, the national recession and slow growth in the paper industry caused demand for paper machinery to fall off. The years 1990 and 1991 brought layoffs equalling over 15 percent of the industry total. ECH Will Corporation saw its payroll drop by approximately two thirds between 1990 and mid-1992. ECH Will is now planning to shut down its Berkshire plant in December. 1992 and move its operations to Wisconsin — a decision which will require laying off its remaining 50 to 60 person workforce. Although the past two years have been difficult for the paper machinery industry, the outlook is promising. Recent losses have been due primarily to cyclical factors rather than long-term structural problems. As the country emerges from recession, the Berkshire paper machinery industry is expected to resume its growth pattern. Arthur D. Little has projected growth in this area at 8 percent annually through 1995. The low U.S. dollar will further increase the competitiveness of American firms abroad, expanding the potential for Berkshire firms

to make inroads into foreign markets. Also promising is the fact that a number of local firms have made significant investments in plants, equipment and training. Beloit Corporation, in particular, has invested heavily in equipment and worker training and appears well poised for the future.

Interaction between paper product and paper machinery firms generates a positive dynamic which cannot be easily quantified. Nevertheless, the network of local relationships is an important characteristic of the paper-related industry in Berkshire County. Given the high proportion of Berkshire paper firms involved in specialty markets and the accelerating technological standards in the industry, the existence of several local paper machinery producers is a major advantage. The high concentration of firms involved in paper production provides a constant supply of local demand for the paper machinery industry and is an important resource for understanding and anticipating market needs.

Defense/Fabricated Metals

Another long-standing and important component of the Berkshire economy is the fabricated metals industry. General Electric Aerospace is the major firm in this sector, and total industry employment depends greatly on its fortunes. GE Aerospace's core business has been defense systems such as the Bradley tank, naval gun turrets, and the MK 80 director system. Unfortunately, the past three years have been difficult ones for GE. Due to the deep defense budget cuts, there has been an industry-wide decline in demand, resulting in increased competition for existing contracts. These conditions have forced the aerospace division to shed a large share of its workforce in an attempt to reorganize and cut costs. Between 1988 and 1991, an estimated 1,200 GE Aerospace workers were laid off. The recent loss of a "winner takes all" Phalanx contract to General Dynamics has dealt the company another serious blow. Although the contract would have been unlikely to increase employment at GE, Phalanx had been seen as a means of stemming further job losses. At present, GE Aerospace employs 2,650 people in the region.

In late November 1992, GE announced that it would merge its aerospace operations into Martin Marietta for $3.05 billion. The ultimate impact of the deal upon the division's employees in Pittsfield is still unclear. Neither GE nor Martin Marietta has made official comments on possible plant closures. There have been indications, however, that the minimal amount of duplication between Martin Marietta and GE operations will keep plant shut-downs low. The Pittsfield operation has long-range defense contracts for the next few years and spare parts production which could keep it in business for years to come. A local task force is working with Martin Marietta to preserve as many jobs as possible in the Pittsfield area. The prospects for winning new contracts are not good, however. Even without the potential of a Martin Marietta-inspired plant closure, the outlook for the fabricated metal industry in the Berkshire Region is not positive. The nature of the problems in this sector are structural rather than cyclical, and it is unlikely that the Berkshire defense industry will rebound to pre-1989 employment levels when the national and regional economies recover. Although there has been considerable local enthusiasm for the conversion of Berkshire defense systems operations to non-military production, neither GE nor Martin Marietta has, to date, expressed any interest in exploring such opportunities.

Tourism

Berkshire County has exceptional natural and cultural endowments. The Berkshire Mountains offer physical beauty with a unique New England flavor. Ski resorts such as Jiminy Peak and Butternut Mountain cater to visitors from New York, Connecticut and elsewhere. The Appalachian Trail transverses the Berkshires, bringing thousands of hikers through the county every year. Musical, dance and dramatic activities at Tanglewood, the Mount, Jacob's Pillow and Williamstown make Berkshire County a major cultural center during the summer. These and other attractions such as Hancock Shaker Village, the Clark Art Institute and the Rockwell Museum bring 1,000,000 to 1,500,000 visitors to the region every year. In addition to short-term visitors, there are approximately 6,000 second home residents in the region who play an important and growing role in the Berkshire economy. A sizable tourist industry, characterized by a high concentration of eating and drinking establishments, retail stores, lodging, and amusement and recreation services, has developed in response. In 1991, tourism-related industries employed a total of 9,360 people, or 18.5 percent of total private employment in the county. Employment statistics do not separate out what part of a restaurant's clientele are tourists and what part is local. The same is true for other related sectors like retail. Accordingly, these figures must be discounted to take into account normal local demand. It is clear, however, that tourism is a major source of employment in the Berkshires — especially in the South County. What is also clear is that Berkshire County's hotels, eating places, resorts, shops, museums and other tourist-related enterprises form a cluster of interrelated industries which complement and reinforce each other. The dynamics of this cluster can also generate opportunities for small business entrepreneurs. One notable example of this is Country Curtains, which has achieved rapid growth built on the demand of consumers brought to the area by the tourist industry. Today, Country Curtains has a large mail-order business and ranks among the largest employers in the region.

Recent performance in the tourist industry has been adversely affected by the decline in consumer spending associated with the national recession. Total sector employment declined by 8.1 percent between 1988 and 1991. Particularly hard hit have been amusement and recreation services such as ski resorts where employment declined by 18.8 percent in the peak-to-trough period of 1988 to 1991. One bright spot has been the

growth of personal services employment. The opening and success of the Canyon Ranch Spa, in particular, has added over 400 jobs to the region since 1989. This has been heralded as an important development because of the high wage nature of these jobs and is a positive step towards making tourism in the Berkshires longer-term and non-seasonal.

The Massachusetts Museum of Contemporary Art (MOCA) proposal to establish an art museum in empty buildings in North Adams previously occupied by Sprague Electronics with a mix of public and private financing has been put on hold pending a review. The project's organizers have been given a private fundraising target of $12 million by July 31, 1993 to leverage $36 million in public funding. Greylock Glen, another proposal to expand the tourist industry in the North County, ran into difficulty with environmental groups during the 1980s. A new proposal has, however, been forwarded to create an environmental and conference center on the mountain with a recreational complex which would offer hiking, horseback riding, cross-country skiing, and golf facilities. Despite the problems with these high-profile tourism projects, employment gains are expected in tourist-related industries as the economy begins to grow. One promising recent development is Lenox's selection from among over 60 towns nationwide as the site for the new National Music Center. This project is expected to attract thousands of new visitors to the region every year.

COMPETITIVE ADVANTAGES OF THE BERKSHIRE REGION

Location and Infrastructure

The Berkshires' locational advantages relate largely to the quality of its environment, not to its proximity to markets or population centers. The distances are not overwhelming, however, when compared to other, more remote parts of the country. Pittsfield is 137 miles from Boston, 142 miles from New York City, 133 miles from Providence, 89 miles from Worcester, 54 miles from Springfield and 37 miles from Albany. This central location gives Berkshire industries reasonable access to most major northeast markets, suppliers, contractors and consultants.

In terms of its physical infrastructure, the Berkshire Region has the advantage of being accessible by a well-developed rail system. Freight can be carried north-south by rail over the Housatonic Railroad, which connects with Conrail in southern New England. East-west service is supplied by Guilford Transportation through northern Berkshire and by Conrail in the south. A number of recent developments indicate that rail access to the Berkshires will improve in the near future. The Housatonic Railroad is planning to move its main transfer point to Pittsfield — a move it expects will generate a four-fold increase in freight traffic. Guilford has just signed a deal with Canadian Pacific Railroad, which means that there will be direct access to most of the North American continent. Berkshire County's rail infrastructure is well-suited to the needs of the nondurable manufacturing industries which appear to be the region's primary growth areas for the future.

Berkshire County's physical beauty and extensive cultural resources constitute a significant area of competitive advantage compared with other potential business locations. Not only do these factors make the region a pleasant place to work, but it is a particularly attractive area to raise a family. These advantages are likely to become all the more significant as advances in information technology make geographic proximity less important for most day-to-day business needs.

Business Costs

The Berkshire Region generally has lower costs than other urban northeast regions. Average wages lie well below the statewide average. Statistics for the Pittsfield area show that wages are more than 11 percent below state averages and, in some areas, such as industrial machinery, local workers are paid 16 percent less than the state average. Industrial land prices are generally low in the region, and there is a significant oversupply of commercial property on the market. There are a number of industrial complexes across the county made available by downsizing at companies such as Sprague Electronics, GE and ECH Will. The troubled North County may, however, be less well positioned in this respect. The Berkshires' cost competitiveness counterweighs its lack of the location, infrastructure and technical strengths of many other Massachusetts regions.

Educational Resources

The success of the Partners in Education program, which brings business and schools together to improve primary and secondary education, has served to strengthen the region's educational infrastructure. A number of schools now work with businesses on mentoring, internships and other programs designed to prepare students for successful entry into the workforce. Employees from Crane, GE, Petricca Industries and many other firms help as substitute and after-school teachers. The two-year apprenticeship program run by region's community colleges and plastics companies is also proving to be a success. These programs seem certain to bring ongoing dividends to the region by improving the overall quality of education and endowing the region's young people with skills and training which will be particularly valuable in the workplace. North Adams State College's decision to offer free classes to the unemployed workers of the North County areas is also a very promising development.

Berkshire Regional Profile

WorkForce Skills and Availability

The Berkshire Region's large population of engineers and machine operators offers potential employers a mature and skilled workforce. As Figure 9H illustrates, Berkshire has a higher population of skilled manufacturing workers than the state average. Recent downsizing in fabricated metals and electronics have created sizable pools of highly skilled labor. Therefore, companies planning to expand or relocate their operations would have the advantage of not needing to train their new employees.

Occupational Distribution in the Berkshire Region & Massachusetts, 1990

	Berkshire	State
Management	11.2%	14.6%
Professional	17.0%	17.4%
Technical	3.9%	4.2%
Sales	11.3%	11.4%
Clerical	15.3%	17.3%
Services	14.7%	12.8%
Farming and Forestry	1.4%	0.9%
Precision Crafts	12.7%	10.0%
Machine Operation	6.9%	5.6%
Transportation	2.9%	2.9%
Labor	2.8%	3.0%
Total	100%	100%

Figure 9H

Quality of Life

Berkshire County's physical beauty and extensive cultural resources constitute a significant area of competitive advantage compared with other potential business locations. Not only do these factors make the region a pleasant place to work, but it is a particularly attractive area to raise a family. House prices in the region are also very attractive. In 1990, for example, the median house price in Berkshire County was $114,900 while the median monthly rent was $365. The median house price statewide the same year was $162,800, and median rent was $506. These advantages are likely to become all the more significant as advances in information technology make geographic proximity less important for most day-to-day business needs.

CHALLENGES TO FUTURE GROWTH

Location and Infrastructure

While centrally located, Berkshire County is not immediately proximate to major economic or population centers. The fact that the Berkshire region is the Massachusetts region most distant from suppliers and markets in the Boston area imposes relatively high transportation costs on local firms.

Berkshire County's main infrastructure weakness is the poor north-south connection to the Massachusetts Turnpike and Route 2. Route 7 is congested and fails to provide sufficient passenger and commercial access to the Turnpike. Route 8 is not currently connected to the Turnpike and, therefore, cannot provide sorely needed interstate access for central and southern Berkshire. There are also widespread problems due to the region's narrow roads and bridges which cannot handle high volume traffic. Unfortunately, these problems are unlikely to be resolved any time in the foreseeable future. The north-south access issue, in particular, has been debated for years, and divisions between local communities appear too deep to achieve a compromise solution. The lack of regularly scheduled passenger air service to the region is another transportation weakness.

Investment

Adequate access to credit and capital for business purposes is a long-standing problem in Berkshire County. The region does not attract great attention from the large Boston and New England commercial banks and suffers from a generally underdeveloped local banking system. Massachusetts' quasi-public corporations have only a marginal presence in the region. Lending has been particularly sparse over the past four years due to the fall in real estate prices and the failure of the Bank of New England, which had been one of the main lenders in the region. There have been some recent signs of improvement. Some of the smaller local banks, such as the First National Bank of the Berkshires, have been aggressively entering the commercial lending market. Fleet Bank and First Agricultural Bank also appear to be making new capital available in the region, although the recent sale of First Agricultural's parent company has caused considerable anxiety in the business community. Credit and capital remain exceptionally difficult to obtain and there are virtually no sources of venture capital available at all.

Educational Resources

Although North Adams State College, Williams College, Simon's Rock College and Berkshire Community College all provide resources for undergraduate liberal arts education, none have technical graduate programs. This shortcoming deprives Berkshire businesses of most of the research and development benefits of industry-university cooperation which can be found in a number of other regions in the Commonwealth. The University of Massachusetts at Amherst has worked with Berkshire County industry on a few projects, but this does not compensate for the lack of a local university resource. Although Rensselaer Polytechnic Institute is located less than an hour's drive away in upstate New York, the region has thus far failed to fully exploit its considerable resources. There is, however, some indication that North Adams State College is interested in developing a closer relationship with local businesses, as indicated by its recent cooperation with the North Berkshire Development Corporation in studying the potential for bringing arts and crafts manufacturers to the North County area.

Workforce Skills and Availability

One potential disadvantage of the Berkshire Region over the long term is the potential for the outmigration of skilled labor. As a result of the small number of employers in the region and the lack of any major labor markets nearby, there is the danger that unemployed skilled workers may be tempted to move out of the region in search of employment. This would be a particularly serious negative development

Berkshire Regional Profile

in that one of the region's primary competitive advantages is its ready supply of engineers and machine operators.

Distressed Areas

Recent economic performance in the Berkshire Region has not been strong. Even within this context, however, there are certain areas which require special attention because of their particularly serious economic problems. These distressed areas fall into two main categories: small cities and larger towns which have seen their industrial base collapse, and small rural towns which have virtually no local business or industry at all. A good example of the first category is the town of North Adams, which posted an annual average unemployment rate of 11.4 percent for 1992. A victim of the structural shift away from manufacturing, North Adams has experienced a long-term erosion of its industrial foundation — the departure of Sprague Electronics being only the latest traumatic development. The second group of distressed areas is exemplified by communities like Otis and Savoy, which have staggered under 1992 annual average unemployment rates of 13.1 percent and 12.5 percent, respectively. These towns have not only suffered because of the decline of the region's main industrial centers, but have experienced a drastic decline in the number of local shops and business establishments as well. This crisis has been caused by the loss of market share due to the development of large malls and superstores in the region and outmigration. The degree of social dislocation caused by these economic problems is reflected in poverty statistics for the region. Although Berkshire County as a whole has a relatively modest 8.7 percent poverty rate, fully 14.3 percent of North Adams' population falls below the official poverty line. In Otis, the figure is 11.6 percent. Although a national and regional economic upswing might alleviate some of the misery in these areas, the root causes of the problems in these areas are structural and will therefore defy easy solutions.

An artisan practices his craft at the Hancock Shaker Village, one of the Berkshire Region's many cultural attractions. Tourism and the related crafts industry are an important part of the Region's base economy. *Photo courtesy of the Massachusetts Office of Travel and Tourism.*

REGIONAL POLICY PRIORITIES

The overall development goal of the Berkshire Region is the attainment of a higher standard of living for the local population based on the growth of internationally competitive companies and a highly productive workforce. The local approach is governed by a desire to address the region's immediate challenges while simultaneously laying the foundation for long-term growth and prosperity.

Investment

One fundamental development objective in the Berkshire Region is to improve business access to investment and credit. There is a strong sense in the region that investment and credit problems are worse in the Berkshires than in most other parts of the Commonwealth. One primary reason for this is that Berkshire County is located furthest away from Boston, the Commonwealth's financial center. Another reason is that the Berkshire Region has an unusually high proportion of very small firms: 55 percent of all business establishments in the region have fewer than 5 employees. Large Boston and New England banks are generally not interested in lending money to the Berkshires' small industrial undertakings. Local banks are unable to meet the loan needs of local business and industry on their own. Specifically, there seems to be a gap in the $25,000-$75,000 range, which is vitally important to the Berkshires' particular mix of modest-sized mature and new companies. As a result, growth in the region is constrained as firms are unable to make the equipment, plant and training investments that would allow them to expand.

Several of the programs described in this *Strategy* address these issues:

- The Small Business Capital Access Program could stimulate working capital loans to small businesses such as those found in the Berkshire Region.
- An Early Stage Equity Capital Program would help the region's new companies to obtain the patient capital they need to get started.
- A long-term capital gains tax reduction and an increase in the Investment Tax Credit could make private investment in new and small businesses significantly more attractive.

Education

Lower than average educational attainment levels in Berkshire County make educational improvement another key development objective. The Berkshire County Regional Employment Board has reported that 30 to 35 percent of incoming freshmen at Berkshire Community College require remediation in math or English. The provision of basic skills in schools must be improved by setting more stringent achievement standards. Greater attention also needs to be paid to students who are not college-bound. School-to-work transition training, in particular, needs to be emphasized to help orient

and prepare students for the labor market. Dialogue between businesses and schools must be established to ensure that education and training programs match the current and future needs of business. The Berkshire Partners in Education program has made significant strides in addressing these concerns, but a great deal more can and must be done. The educational system must be upgraded and must do more to imbue students with skills which will help them become productive members of the workforce.

The education reform effort described in this *Strategy* addresses these issues:

- The provision of basic skills in schools must be improved by implementing a core curriculum and setting more stringent achievement standards. Reform can eliminate many existing barriers to educational excellence.
- The Berkshires should be among the primary beneficiaries of recent and future innovations in educational technology. Computer networks linking schools, colleges and universities will allow students and teachers in the Berkshires to access educational resources throughout the state.
- Additional state funding for education will be directed at ensuring that even the poorest areas in the Berkshires will be able to provide a quality education for their children.

Training

Due to the major structural shift taking place in the Berkshire manufacturing sector, training and retraining must play a central role in the region's economic development effort. The decline of the region's traditional durable manufacturing sector has left the Berkshire labor market with a mismatch between labor force skills and industry requirements. Therefore, retraining must be pursued aggressively in order to keep dislocation to a minimum. Berkshire County's distance from other major labor markets makes it inordinately important that the local workforce possess skills that coincide with industry needs. The alternatives within the county are so limited that many workers may be tempted to move elsewhere unless they have a means for obtaining the skills they need. Training is also crucial because many Berkshire employers depend upon niche markets and sophisticated production processes which allow them to compete with larger and more advantageously located rivals. This sort of approach makes a skilled and flexible workforce particularly important. Specifically, the Berkshire Regional Employment Board has identified a need for improved technical, computer, and process control training.

Several of the efforts described in this *Strategy* address these issues:

- The Mass Jobs Council is working to create a workforce development system that closely matches training to the current needs of the Berkshire region's key industries.
- The Commonwealth can create special representatives to work closely with key industries to insure that worker training keeps pace with technological change and anticipates the needs of business.

Know-How and Industrial Modernization

The small size of the average firm in the region and the locational disadvantages of Berkshires' industries mean that it is vitally important for many of the region's firms to stay abreast of new methods and processes in order to stay competitive with their counterparts outside the county. Due to the region's location and the absence of a major research university, achieving this requires a far greater effort in the Berkshires than it does in most other regions. Coordinated state, business and university action must be undertaken to compensate for this potentially serious regional shortcoming. Berkshire industry must stay ahead of the efficiency and quality curve if it is to remain competitive over the long term.

Some programs described in this *Strategy* address these issues:

- An Industrial Extension Service could dramatically improve efforts at disseminating information on "best practices" and would focus particularly upon small firms such as those found in the Berkshires.
- Know-how and industrial modernization can also be encouraged through an effort to improve business ties to the Commonwealth's university and college system.

Infrastructure

From the perspective of the needs of business and industry, the road infrastructure of the Berkshires is the worst in the Commonwealth. Deep disagreement within the county appears to preclude near-term consensus on the possibility of building a new means of north-south access through the county. This inability to reach consensus must be recognized as an important stumbling block to improving the competitiveness of the Berkshires Region. In the meantime, the quality of the existing road system can be improved. There are a number of stretches of road within the county that have been identified as sorely in need of widening. Route 8 is in particularly acute need of improvement. Business leaders in the county have also drawn attention to the fact that there are a number of local bridges which are sub-code for supporting the weight of the trucks which regularly pass over them. Due to the weaknesses of its other transportation infrastructure, the Berkshire rail system is particularly important to the region's economic development. It is, therefore, a regional development objective to expand the capacity of rail freight in the region.

Several of the programs described in this *Strategy* address these issues:

- The state is working to remedy the region's many road and bridge problems. In 1993, the Commonwealth will go forward with a number of road and bridge reconstruction projects in Adams, North Adams, Florida, Great Barrington, Lee, Lenox and Pittsfield.
- An Economic Development Capital Program could assist the creation of industrial park facilities by funding necessary public infrastructure improvements.

Berkshire Regional Profile

- The Commonwealth's work with the Guilford Transportation Company to facilitate double stacking on its routes through the county can significantly improve the capacity of the region's rail infrastructure.
- The construction of state-of-the-art tourist information booths along the region's major access routes would be of considerable benefit to the Berkshire tourist industry.

Regulatory Environment

High health care, workers' compensation and unemployment insurance costs constitute a major competitiveness concern in Berkshire County. The region's comparative advantage lies in its high skill, but relatively low margin industries. The added burden which the Commonwealth's strict regulations impose on business is, therefore, a major impediment to growth — especially among the small businesses which comprise a large proportion of the establishments in the region. The Berkshires' close proximity to New York, Connecticut and Vermont — all of which offer more expedited approvals — also makes these rules an uncommon liability to the region. As the region situated furthest from Boston, the administrative problems involved in obtaining permits and approvals are felt most severely in the Berkshires. It is difficult for Berkshire entrepreneurs and businesspeople to have to commute over 100 miles to gain authorization for their undertakings. Clearly, environmental quality is one of the Berkshires' chief assets. Thus, needed improvements to the regulatory system should emphasize procedural streamlining rather than lowered standards and should include expanded access to the regulatory process at a location convenient to the region.

Several of the programs described in this *Strategy* address these issues:

- The regulatory process must become standardized and streamlined to reduce the burden it currently imposes upon Massachusetts business.
- A regionalized system of one-stop shopping offices would make regulatory compliance far easier and more efficient for Berkshire industry.
- Reform of certain environmental regulations such as the state's hazardous waste cleanup law will help make development of certain sites easier.

Technology Transfer

Lacking a major research university and situated too far away to take advantage of the research and development resources available in the Metro Boston area, the Berkshire Region is at a significant disadvantage with respect to technology transfer when compared to most other regions in the Commonwealth. This is particularly problematic because of the acute need for the region's high concentration of small high value-added niche producers to remain up-to-date with recent technological developments and innovations. The Berkshire Regional Employment Board has emphasized the need to expand referral services, coordinate technical assistance resources and improve awareness of existing technical services.

Several of the programs described in this *Strategy* address these issues:

- The Commonwealth should help to foster technology partnerships linking Berkshire companies, and public and private university and research laboratory resources.
- In particular, the Commonwealth will encourage Berkshire firms to take advantage of the University of Massachusetts at Amherst's technology transfer and commercialization capabilities.

New and Small Businesses

The need to encourage the creation and retention of new and small businesses was a development objective stressed repeatedly in the Berkshire regional conference. Business development is inordinately important in the Berkshires because of the pivotal role which small businesses have in the Berkshire economy — particularly with respect to job creation. Assistance that would allow new and small firms to attend domestic trade shows could be very important, as many local firms lack the resources to pursue large-scale marketing schemes on their own. The Berkshire Plastics Network provides a clear example of how a small amount of initial assistance by the Commonwealth can assist a large number of firms with marketing. Other means of stimulating new and small business development must be pursued.

Several of the programs described in this *Strategy* address these issues:

- Access to patient capital and credit can be facilitated through an Early-Stage Equity Finance Fund and the Small Business Capital Access Program.
- New and small businesses should be provided with an abbreviated regulatory process to help reduce the tremendous administrative burden placed on entrepreneurial undertakings by the current system.

Export Promotion

The internationalization of most markets has made the promotion of exports increasingly important to overall competitiveness. The Berkshire specialty paper products and paper machinery industries in particular have the potential to make significant inroads into European markets if the process is pursued properly. Technical assistance and the promotion and marketing of Berkshire products abroad could generate significant export growth in the region. Tourism is a vital component of the Berkshire economy which could also be significantly assisted through better marketing abroad. The marketing of the Berkshires as a summer, ski, and cultural vacation center would enhance the tourism, hotel, restaurant, and retail sectors.

Several of the programs described in this *Strategy* address these issues:

- An export finance program would help Berkshire County's many small firms to obtain the loans they need to enter foreign markets.
- Technical and marketing assistance through the Massachusetts Office of

International Trade and Investment and the Small Business Development Corporation can help stimulate significant export growth in the region.

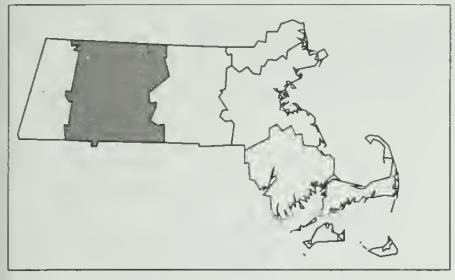
Rural and Small Cities

As a region comprised entirely of rural towns and small city areas, the Berkshires has a set of problems and needs which are distinct from those of most other Massachusetts regions. The region's poor transportation infrastructure, lack of educational resources and narrow industrial base are very different from the primary issues in Greater Boston, the Northeast Region and other regions which have traditionally received the greatest attention. In order to ensure that Berkshire County is not left behind in the process of economic development, special attention will need to be paid to its problems, and efforts must be undertaken to support its strengths.

Several of the programs described in this *Strategy* address these issues:

- Economic opportunity areas could be created in the distressed areas of northern Berkshire County to promote business creation and community revitalization.
- The Executive Office of Communities and Development provides support for rural and small city governments through its Municipal Incentive Grants and Strategic Planning Grants.
- The new Massachusetts Rural Development Council will provide a focus for rural development efforts in the Commonwealth.
- Tourism-related programs such as the Massachusetts Heritage Discovery Network, "Welcome to Massachusetts" information centers, and the marketing of Massachusetts tourism and crafts products can all be of great benefit to the Berkshire Region.

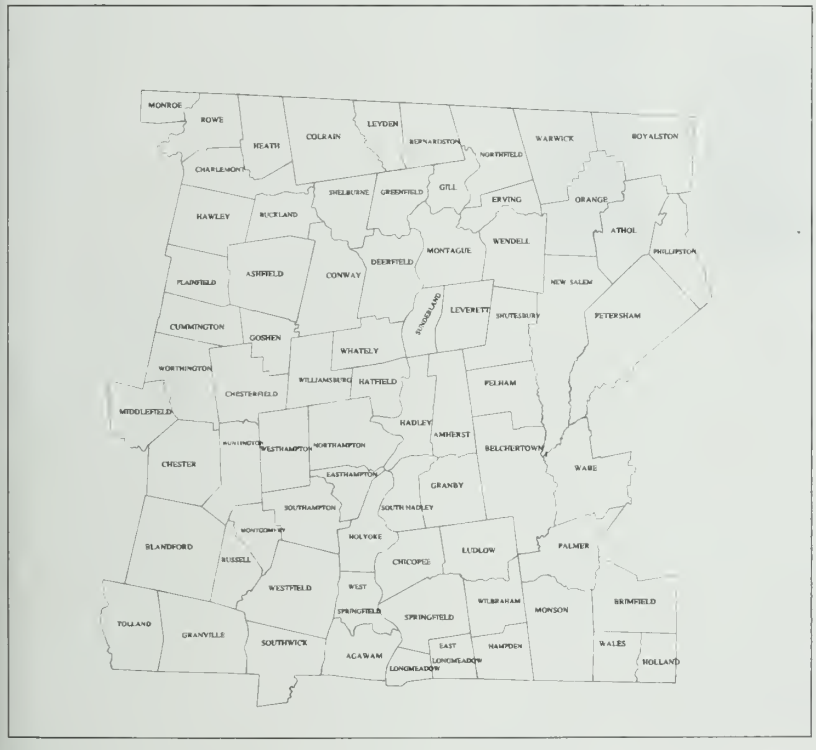
Chapter 10 Pioneer Valley Regional Profile



CHARACTERISTICS OF THE REGION

Geographic Description

The Pioneer Valley, the fourth largest metropolitan area in New England, encompasses a variety of industrial cities, college and market towns, and rural communities in the western part of Massachusetts. The Connecticut River and its tributaries run through the region and have shaped its settlement patterns. Its boundaries roughly correspond to the region's three counties — Hampden, Franklin and Hampshire. The southern end of Hampden County borders Connecticut, and its economy is linked to that of Connecticut. The Pioneer Valley's three largest cities are Springfield (the state's third largest city), Chicopee, and Holyoke, with 1990 populations of 156,983, 56,632 and 43,704, respectively. The region also has three smaller cities: Northampton, Westfield, and Agawam.



Economic History and Overview

Springfield, Holyoke, and Chicopee had their origins as manufacturing towns. In 1794, the first U.S. Armory was established in Springfield, which specialized in manufacturing firearms and fabricated metal products in its early days. (In 1854, the metal ammunition cartridge was patented by D.B. Wesson, forerunner of the Smith and Wesson firm). Holyoke started out as a textile town but became successful as it turned to making paper. Chicopee also competed in textile production, then diversified into subsidiary manufacturing industries such as bicycles and, later, automobiles.

This manufacturing tradition has extended to modern times, though the region has also become home to a large cluster of colleges and universities and insurance companies. Many Pioneer Valley companies are subcontractors, producing parts for other manufacturers located in the eastern part of the Massachusetts and in Connecticut. The metalworking industry has been tied to the defense industry for many years, and is feeling the pressure of defense budget cuts. The paper and industrial machinery industries are under pressure from foreign competition and have trouble competing due to their cost structures. Many manufacturers in the region have downsized, streamlined or disappeared, and all this has meant a loss of jobs. Local industries will most likely need to continue dealing with these challenges in the near term, and further consolidation is likely. Nevertheless, many firms have been taking steps to become more competitive and many new businesses are being developed in industries such as advanced materials, high tech instrumentation, and computer science.

Population Characteristics

At the time of the 1990 Census, the population of the Pioneer Valley was just over 688,000. This represents 11.4 percent of Massachusetts' total population and nearly 10 percent of its total workforce. Hampden County accounts for approximately two thirds of the region's total population and 70 percent of the region's workforce. Between 1980 and 1990, the region's population grew 4.4 percent, slightly less than that of the state as a whole. The Hampden subregion grew approximately 3 percent, while Franklin and Hampshire grew approximately 7 percent. The largest increase in population for the region as a whole occurred in outlying rural communities, though Springfield also gained population between 1980 and 1990, following two decades of population losses.

Pioneer Valley Regional Profile

Approximately 13 percent of the Pioneer Valley's population is non-white, and nearly 20 percent of the state's Hispanic population lives in this region (see Figure 10A).

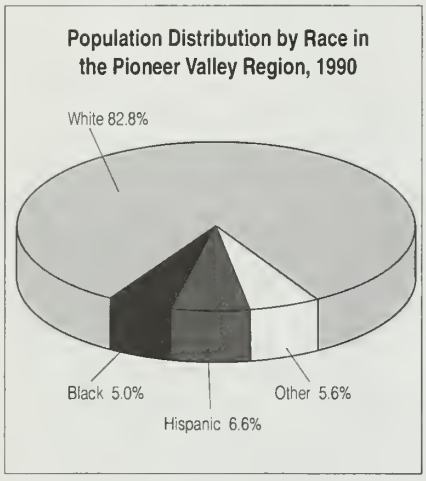


Figure 10A

Between 1980 and 1990, the white population decreased by about 3 percent, while the Hispanic and non-white population increased by about 60 percent. There are large Hispanic communities located in both Holyoke and Springfield. Holyoke is presently 31 percent Hispanic (versus 13 percent in 1980) and Springfield is 16 percent Hispanic. Springfield's population is also about 19 percent black. The median ages of the black and Hispanic populations are significantly lower than that of the white population. Specifically, the median age of the white population in Hampden County is 35, while the median ages of the black population and the Hispanic population are 26 and 20, respectively.

The Pioneer Valley's educational attainment relative to that of the state as a whole is mixed. According to the 1990 Census, 80 percent of the Commonwealth's residents had at least a high school degree, while 27.2 percent had at least a bachelor's degree. Residents of the Pioneer Valley with at least a high school diploma were 77 percent of the total, up from 69 percent in 1980. Residents of the region with at least a bachelor's degree were 21.2 percent of the total, up from 16.6 percent in 1980. See Figure 10B. Residents of Hampshire County had higher educational attainment at both the high school and college levels than the region or the state. Hampden County residents had lower educational attainment levels than both the region and the state, and Franklin residents had higher educational attainment at the high school level and lower at the college level.

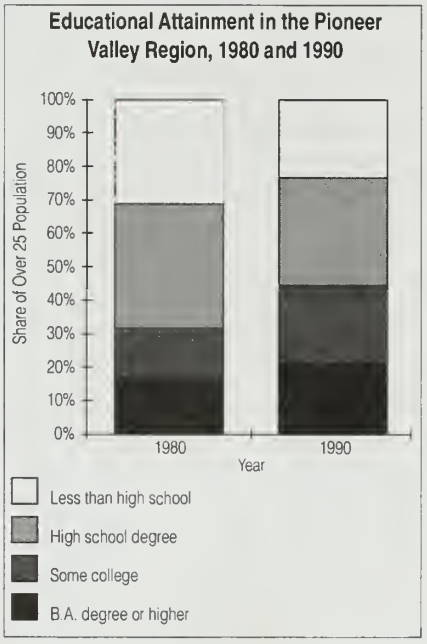


Figure 10B

Due to a relative lack of high wage manufacturing jobs, the workforce in Franklin and Hampshire has a lower average wage than that in either Hampden or the adjacent Berkshires. In 1989, the annual salary of a worker in Franklin and Hampshire was $20,253 (in current dollars), about $1,460 less than the average annual wages in the other two regions. In Hampden County, the 1989 average annual wage was $21,683. This was 86 percent of the statewide average of $25,220. In 1980, Hampden's wages were 92.5 percent of the state's wages. The average manufacturing job in the region paid $27,554 in 1989, versus $19,635 in services and $12,045 in retail trade. In contrast, service jobs in the state as a whole paid an average of $24,010, largely due to the export component of many service jobs in other parts of the state.

Since wages account for most of earnings, per capita income growth in all three counties is lagging. According to the 1990 Census, the state as a whole had a per capita income of $17,224. In contrast, Hampden County had a per capita income of $14,029 in 1989, while Hampshire County had a per capita income of $14,414 and Franklin County had a per capita income of $13,944. These are among the lowest in the Commonwealth.

INDUSTRY AND EMPLOYMENT TRENDS

Recent Developments

Between the fourth quarter of 1988 and the fourth quarter of 1991, 31,560 jobs were lost in the Pioneer Valley — a net reduction of 10.8 percent (versus a drop of 11.3 percent for the state as a whole). Most of these losses (26,110) resulted from declines in private, i.e. non-government, employment. For the same time period, manufacturing employment declined 14.7 percent and retail declined 13.3 percent, while services increased a fraction. Manufacturing losses are part of a continuing trend in the regional economy: 12,480 manufacturing jobs were lost between 1983 and 1991. Manufacturing jobs represented 25 percent of total employment in 1983 but only 19 percent in 1991. Retail job losses resulted from excess capacity, job losses in other industries and stagnant income growth. Trends in the service sector are the reverse of manufacturing: there were 15,054 jobs added in services between 1983 and 1991. Services represented 22 percent of total employment in 1983 and 27 percent in 1991. Recent job gains occurred for the most part in private health services. There were, however, some gains in private education and social services, offsetting a 16 percent drop in business services employment. See Figure 10C for details in changes in employment by industry from 1983 to 1991.

Employment in the finance, insurance, and real estate sector declined 7.5 percent from the fourth quarter of 1988 to 1991. Monarch Capital's financial problems led to large layoffs during this period, while the

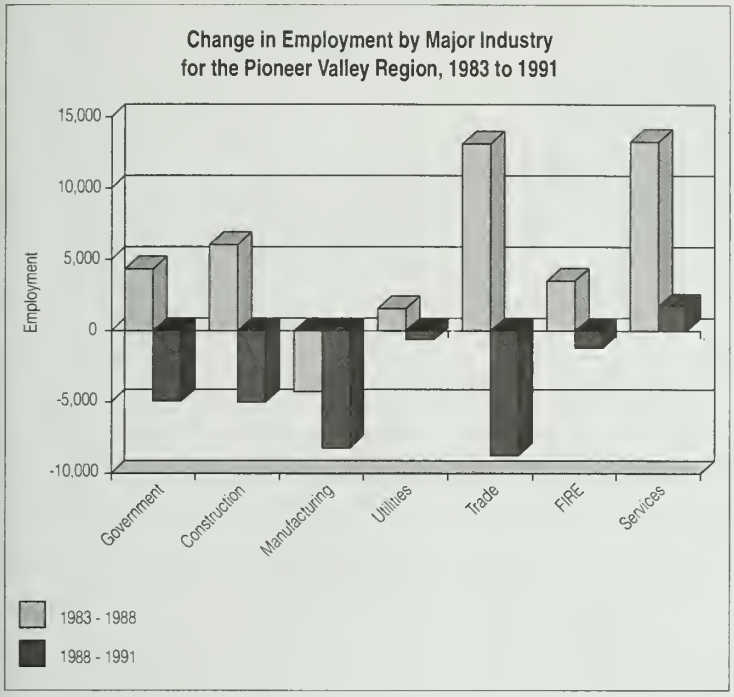


Figure 10C

Massachusetts Mutual Life Insurance Company reduced its payroll through attrition and early retirement. The collapse of Bank of New England, Heritage Bancorp and Vanguard Savings Bank resulted in layoffs as offices were closed. The region's largest percentage decline in employment occurred in the construction industry (3 percent of total jobs in the region), where approximately 40 percent of all jobs were lost between the fourth quarter of 1988 and 1991.

On a subregional basis, Franklin and Hampshire lost about 6,540 jobs in the 1988 to 1991 period, representing a decline of 7.9 percent. Hampden lost about 24,960 jobs, or an 11.9 percent drop. The two areas had similar patterns of job losses by industry, with the largest losses occurring in manufacturing, retail trade, government, and construction.

Unemployment rates for the region as a whole were higher than for the state as a whole in the early 1980s, reflecting the drop in manufacturing employment connected with the recession of that period. Unemployment rates kept pace with the state average through 1991, when the regional rate once again exceeded the statewide rate due to defense-related manufacturing declines. See Figure 10D.

The employment figures for the industries discussed below are summarized in Figure 10E, showing change in Pioneer Valley employment by major industry from 1988 to 1991.

Critical Industries

A base industry is one that brings new money into a region; it can also be called an export industry. Because of the large number of higher educational institutions in Hampshire County, education is a base industry in that area. There is a large regional concentration of insurance industries in Hampden County, with the Massachusetts Mutual Life Insurance Company alone employing over 4,000 people. Health care also has some regional concentration. With 6,000 employees, Baystate Health Systems is a major employer in the area. It is the holding company for Baystate Medical Center, which is the western campus of Tufts Medical Center and the third largest hospital in New England, and three other local hospitals. Another local hospital network is Providence Health Systems, with three hospitals in Holyoke and one in Westfield. The health services industry also has a concentration of nursing homes and rehabilitation facilities which employ a significant number of people. Many Connecticut residents cross the border to use the Pioneer Valley's health care facilities.

Manufacturing is a critical base industry for the Pioneer Valley Region as a whole, though it is a larger employer in Hampden County than in Franklin and Hampshire Counties. There are many well-established, old-line manufacturers in the Pioneer Valley Region. Among the top 25 largest businesses in the region (ranked by number of employees as of 1992) are such well-known companies as Milton Bradley (employing 2,500 people), Friendly Ice Cream (employing 2,200), Smith and Wesson (employing 1,350), a division of Monsanto (employing 1,010), Spalding Sports Worldwide (employing 1,000) and Strathmore Paper Company (employing 855). Many of the region's largest companies have been downsizing. For example, the Digital Equipment Corporation employed 827 people in Westfield and Springfield in 1992. In November, the company announced that it was closing its Springfield plant, laying off 320 employees, and on January 27, 1993, it announced that it would sell the Westfield plant that employs 445 people. Digital says it will try to find a buyer for the plant rather than just close it.

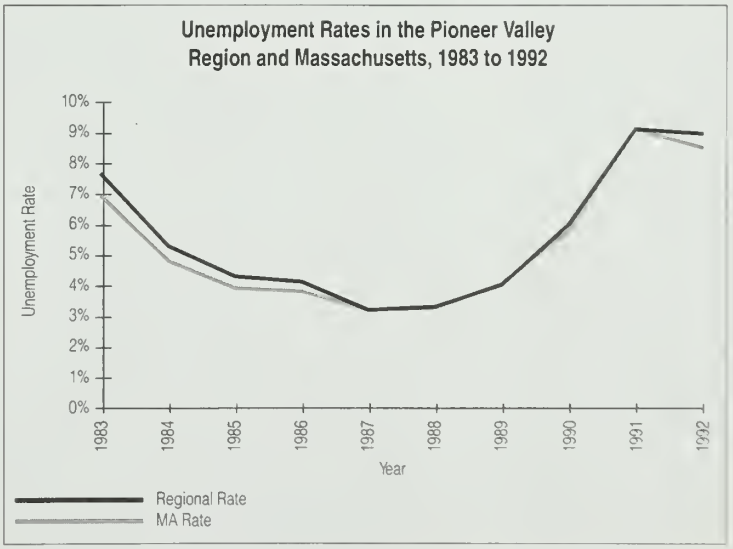


Figure 10D

Four out of five industries designated as "critical" to Hampden's economic health by the Regional Employment Board are manu-

PIONEER VALLEY REGION
EMPLOYMENT BY MAJOR INDUSTRY
1988 Fourth Quarter - 1991 Fourth Quarter

INDUSTRY	EMPLOYMENT CHANGE 1988-1991 FOURTH QUARTER 1988	1991	NET CHANGE	PERCENT CHANGE	PERCENT OF 1991 TOTAL EMPLOYMENT
TOTAL EMPLOYMENT	292,140	260,580	(31,560)	-10.8%	100.0%
TOTAL PRIVATE EMPLOYMENT	242,990	216,880	(26,110)	-10.7%	83.2%
AGRICULTURE, FORESTRY, & FISHING	1,990	1,900	(90)	-4.5%	0.7%
MINING	130	100	(30)	-23.1%	0.0%
CONSTRUCTION	13,050	7,880	(5,170)	-39.6%	3.0%
Special Trade Contractors	7,790	4,960	(2,830)	-36.3%	1.9%
MANUFACTURING	58,730	50,100	(8,630)	-14.7%	19.2%
Food & Kindred Products	2,130	2,060	(70)	-3.3%	0.8%
Paper & Allied Products	9,370	8,190	(1,180)	-12.6%	3.1%
Printing & Publishing	7,330	6,080	(1,250)	-17.1%	2.3%
Rubber & Misc. Plastics Products	4,310	4,030	(280)	-6.5%	1.5%
Fabricated Metal Products	7,530	6,250	(1,280)	-17.0%	2.4%
Industrial Machinery & Equipment	8,350	6,910	(1,440)	-17.2%	2.7%
Misc. Manufacturing Industries	5,100	4,380	(720)	-14.1%	1.7%
TRANSPORTATION & PUBLIC UTILITIES	11,740	10,860	(880)	-7.5%	4.2%
WHOLESALE TRADE	12,950	10,180	(2,770)	-21.4%	3.9%
Wholesale Trade Durable Goods	8,030	5,950	(2,080)	-25.9%	2.3%
Wholesale Trade Nondurable Goods	4,930	4,230	(700)	-14.2%	1.6%
RETAIL TRADE	58,870	51,060	(7,810)	-13.3%	19.6%
General Merchandise Stores	8,010	6,380	(1,630)	-20.3%	2.4%
Food Stores	11,210	10,240	(970)	-8.7%	3.9%
Automotive Dealers & Service Stations	6,060	4,795	(1,265)	-20.9%	1.8%
Eating & Drinking Places	16,640	15,820	(820)	-4.9%	6.1%
Misc. Retail Stores	8,690	7,520	(1,170)	-13.5%	2.9%
FINANCE, INSURANCE & REAL ESTATE	17,400	16,090	(1,310)	-7.5%	6.2%
Depository Institutions	5,460	4,470	(990)	-18.1%	1.7%
Insurance Carriers	7,570	7,160	(410)	-5.4%	2.7%
SERVICES	68,150	68,710	560	0.8%	26.4%
Business Services	7,430	6,270	(1,160)	-15.6%	2.4%
Health Services (private)	25,520	28,520	3,000	11.8%	10.9%
Educational Services (private)	8,090	8,400	310	3.8%	3.2%
Social Services	8,180	8,570	390	4.8%	3.3%
GOVERNMENT	49,140	43,700	(5,440)	-11.1%	16.8%
FEDERAL	6,850	7,150	300	4.4%	2.7%
STATE	11,030	9,740	(1,290)	-11.7%	3.7%
Health Services	2,400	2,380	(20)	-0.8%	0.9%
Educational Services	6,810	5,480	(1,330)	-19.5%	2.1%
LOCAL	31,260	26,820	(4,440)	-14.2%	10.3%
Health Services	960	1,030	70	7.3%	0.4%
Educational Services	18,320	15,890	(2,430)	-13.3%	6.1%

SOURCE:Massachusetts Department of Employment and Training, Employment and Wages/ES-202.
NOTES:Data represent jobs covered by Unemployment Insurance laws. Data are not adjusted for non-economic changes in industry or geographic coding that may have occurred between the comparative periods.
C= CONFIDENTIAL DATA. N.E.C.= NOT ELSEWHERE CLASSIFIED.

Figure 10E

facturing-related. The Board determined the characteristics of a "critical industry" include:

- The industry brings new money into the region.
- A critical mass of firms already exists.
- The industry is responsive to technological change.
- There is room for upward career mobility within the industry.

Consistent with this definition, current critical industries for Hampden are paper and allied products, health and allied health services, fabricated metals, industrial machinery and equipment, and printing and publishing. Industries identified by the Board as emerging critical industries include polymers and advanced materials (related to the plastics industry), computer software and development, aircraft engineering, maintenance and related services, environmental engineering and related services, and diagnostic instrumentation. Polymers and computer software are likely to grow as a result of spin-off companies from the University of Massachusetts at Amherst, while machine shops can expand into aircraft engineering and maintenance as local airports get more non-military use. Environmental engineering is relevant to the paper industry, as interest in energy-saving and pollution control technology continues to grow.

Current critical industries determined by the Regional Employment Board of Franklin and Hampshire Counties include educational services, manufacturing, health and human services, tourism and agriculture. Industries that the Board sees as emerging critical industries are wholesale distributors, environmental businesses, specialty food products, tourism and outdoor recreation, and university spin-off businesses that are technologically innovative. A brief look at Franklin County's employment profile is illustrative. The leading employer of the county's residents is the Franklin Medical Center, which is part of Baystate Health Systems. The other two major employers are the University of Massachusetts at Amherst (located in Hampshire County but only a few minutes away from Franklin County) and the Phoenix Home Life Insurance Company. The Franklin County area was the heart of the tool and die industry 50 years ago, and there are several small machine tool shops still operating there. Franklin County is also a tourist center, including Old Deerfield Village and Shelburne Falls, among others. There are many bed and breakfasts in the area, and many people participate in white-water canoeing. Yankee Candle in South Deerfield employs 400 people, and is a tourist attraction as well as one of the largest candle makers in the country. Hampshire County also has several scenic towns that attract both college students and tourists.

Industry Profiles

Education

Educational services account for about half of the region's service industry-related employment, versus 23 percent in the rest of the state. Colleges and universities alone comprise 23 percent of service sector employment, versus 8.3 percent for Massachusetts as a whole. There were 2,000 people employed by colleges and universities in Hampden and 3,740 in Franklin and Hampshire in 1991. There are 15 institutions of higher education with over 60,000 students in the Pioneer Valley. These include the University of Massachusetts at Amherst, 10 four-year colleges and 3 community colleges. The University of Massachusetts at Amherst, one of the largest employers in the area, benefits the Pioneer Valley in several different ways:

- Payroll, purchasing and spending by students all contribute to the region's income.
- Faculty and students consult with local businesses and community governments to solve local problems.
- Faculty and students have used their academic research to create new businesses and bring new technologies to existing ones.

Paper and Allied Products

Paper and allied products is a mature industry in the Pioneer Valley Region. It has been a fairly stable industry despite fluctuations over the years due to technological advances and changes in demand, supply and location of raw materials. As of 1990, there were 68 paper companies in Hampden County, 70 percent of which employed fewer than 100 people. Franklin and Hampshire Counties each have 8 companies. There were 8,250 people in the Region employed in paper manufacturing and allied products in 1991. This represents 3.6 percent of total employment in Hampden and 3.0 percent of total employment in Franklin and Hampshire.

Some important firms in the area include Mead, Strathmore, Avery Dennison, Southworth Paper, Holyoke Card and Paper Company, and Kansaki Specialty Papers (a large, foreign-owned converter that makes facsimile machine paper). There are large concentrations of paper companies in Holyoke, Chicopee, West Springfield, and Westfield.

The paper industry can be divided into two different types of companies. One type is the primary producers, which process wood fibers, rags or recycled paper into wood pulp, paper, containerboard and boxboard. The other is the converters, which purchase paper and paperboard from primary producers and convert that material into a wide range of finished products including coated, laminated and facsimile paper, and envelopes and stationery, among others. This latter group of companies has overtaken paper producers as the largest employer within this industry. In 1982, 77 percent of paper company employers were converters but by 1987 this figure had grown to 85 percent. This is much higher than the 68 percent at the national level. Some reasons for the decline in primary producers include high labor costs, limited access to water and trees, product obsolescence and the difficulty of siting a new paper mill in the area. Erving Paper Mill is an example of a local firm that is threatening to leave the area because it is not able to find a suitable expansion site.

The other trend that has been significant is downsizing. Employment in the state's paper industries declined 22 percent between 1979 and 1989. In the four counties of western

Massachusetts (Hampden, Franklin, Hampshire and Berkshire), employment declined 16 percent. Job losses have typically resulted from technological innovation and product change. For example, a paper company that makes paper with cotton fibers instead of rags does not need as many employees, and automation advances within the industry have allowed jobs once done by three employees to be done by one. Companies that have survived and prospered have had two important strategies — making continuous capital improvements and competing aggressively in niche markets producing specialty papers. Some firms such as Strathmore Paper Company in Franklin County, have long-term reputations for quality that have been their source of competitive advantage. Innovation, new product lines and niche market expertise will help companies stay competitive and cope with high business costs.

Insurance

Insurance is a critical industry in Hampden County, which is the financial center of western Massachusetts. In 1991, there were 6,540 people employed by insurance carriers in Hampden County, and insurance represented 3.8 percent of total employment. There were 64 insurance carriers in Hampden County as of 1990, including the two largest in the region, Massachusetts Mutual Life Insurance and Monarch Life Insurance Company, formerly part of Monarch Capital. Monarch Capital's financial problems led to bankruptcy, and Monarch Life Insurance was spun off, resulting in layoffs. Massachusetts Mutual announced in November, 1992 that it would lay off 300 people. Life insurance firms have been under pressure in recent years due to competition from other financial products, and the need to cut costs and improve profitability has led to payroll reductions. Hartford and Springfield essentially form a single insurance industry concentration area, with people crossing the Connecticut and Massachusetts borders every day to go to work.

Industrial Machinery and Fabricated Metal Products

The metalworking industry has been in the Pioneer Valley for 150 years, making machinery and parts for everything from cars and bicycles to guns and aircraft. There are about 350 firms in the region, with each firm employing an average of 35 to 40 people, for a total of approximately 13,000 workers. This represents over 40 percent of all manufacturing jobs and roughly 10 percent of all private employment in the region.

Industrial machinery and equipment companies manufacture all types of machines and parts, including metalworking machines (tools, dies, jigs and fixtures), specialty machines for the paper and printing industries, general industry machinery (e.g., air and gas compressors and power transmission equipment), computers and refrigeration and service machinery. Hampden County has 214 companies operating in this industry, with 95 percent of them employing fewer than 100 people. Franklin and Hampshire Counties have 16 and 31 companies, respectively. Total employment in the industry was 6,990 in 1991. Industrial machinery and equipment represents approximately 3 percent of total employment in each subregion. The industry's fortunes are tied to capital spending trends. In order to survive, these companies must continue to improve productivity and invest in new manufacturing technology. Strong competition from machine tool firms in Germany and Asia makes modernization imperative.

Fabricated metal products include cutlery, handtools and hardware, fabricated structural metal products (e.g., metal doors, sashes and window frames), screw machine products and bits, metal forgings and stampings, metal services (plating, coating, etc.) and ordnance and accessories. Of Hampden's 105 firms, 101 have fewer than 100 workers. Franklin has 18 firms and Hampshire has 21. Total employment in fabricated metals was 6,290 in 1991. Fabricated metals represented 3 percent of total employment in Hampden and 1.7 percent in Franklin and Hampshire.

Almost all of these firms are contract shops; i.e. they machine or cast component parts, subassemblies, fixtures, gages and tools for larger firms. Shops compete for bids on the bases of price, quality and on-time delivery. Some metalworkers have developed specialties in certain products, and some have specialized in certain processes, like plating. A few have developed expertise in the use of advanced machining techniques, and this has given them some competitive advantage. However, approximately 85 percent of them do not have any proprietary technology.

The defense and aerospace industries have traditionally been two of the three major markets for fabricated metal products (the other is machine tools). This represents a major problem, as these customers have recently run into trouble. Over the past five years, 1,000 jobs have been lost from Hampden's metalworking industry. Important customers such as the Pratt and Whitney, Hamilton Standard and Sikorsky divisions of United Technologies, General Electric and General Dynamics have seen a severe drop in business tied to reductions in federal defense spending. Pratt and Whitney recently announced a permanent layoff of 10,000 people over the next two years. The dependence of many firms on U.S. Department of Defense (DoD) contracts (some directly and some as subcontractors to firms with DoD contracts), while creating profitable opportunities in the past, represents a major challenge in the future as defense spending continues to decline. For example, along with its own layoffs, Pratt and Whitney will also be reducing its supplier base. Even the DoD work that will continue to exist will not be as profitable as it was in the past due to new laws and pricing regulations. Some large contracts have been cancelled, and some have been split between competitors. With respect to the machine tools industry, orders have fallen due to both the recession and the movement of production to Germany and the Far East.

Other important customers of the Pioneer Valley metalworking industry include the computer and electronic companies located in eastern Massachusetts and, for a few shops, some makers of medical equipment. While these industries have been impacted

by the recession, they offer potential expanded markets in the longer term.

The metalworking industry in Hampden County has several competitive advantages: strong subcontracting networks, skilled, experienced workers, and many firms have acquired sophisticated manufacturing technology. However, this technology has often been underutilized, and the companies need to focus on broadening their skills, product lines, and markets in order to survive and prosper. According to the findings of the Machine Action Project (a research and training organization partially funded by the Massachusetts Industrial Services Program; its purpose is to help strengthen the Pioneer Valley's metalworking industry), a limiting factor for the metalworking industry is that 80 percent of these firms sell only in New England. Finding a way to expand their geographic base would reduce their vulnerability to regional downturns. Another issue is that there are presently very few linkages between the fabricated metal products industry and either the paper or printing and publishing industries located in the region.

Future Growth Industries

The potential to find new non-defense markets for Pioneer Valley products is illustrated by instruments firms that have already been successful in broadening their product and/or customer base. Millitech specializes in making devices to measure changes in atmospheric conditions, and is currently planning to enter the automotive market with a product that would warn drivers of impending collision. The manufacturing of this device would provide significant employment prospects for the region. Another example of adapting to change is a company called Instrument Technology. It started out by making remote viewing devices for jet engines and nuclear power plants, and has since successfully entered the medical market through manufacturing boroscopes. Hutchins Tool and Engineering Company in Springfield started out as a heavy machinery company making products for the aerospace industry, and is now making a product that can be used to help medical technicians and others do Cardio-Pulmonary Resuscitation. American Saw and Manufacturing Company has an international distribution network, with a branch in Germany and a distribution facility in Japan. In the environmental technology area, a Springfield company called Thermaflo has created a new effective and low-cost technology for reversing the effects of chlorofluorocarbons (CFCs). The company is planning to expand its facilities and workforce to accommodate its success.

Printing and Publishing

Printing and publishing includes companies like Merriam-Webster in Springfield (publisher of the dictionary) and the Dow Jones plant that produces the *Wall Street Journal.* There are 127 companies in Hampden County, and 91 percent of them employ less than 100 people. Total employment for the region was 6,070 in 1991. Printing and publishing represents 3.0 percent of total employment in Hampden and 1.4 percent in Franklin and Hampshire. Franklin has 18 companies and Hampshire has 42 printers and publishers. These include newspaper and book publishers, commercial printers and printing trade services firms. Several major advertisers also have printing facilities in the area. The industry has good growth prospects due to the continuing need for and production of information by various service sectors.

Plastics

While plastics is not as major a factor in the Pioneer Valley economy as it is in the Berkshires or in Central Massachusetts, it is noteworthy because of its future growth potential. As of 1990, there were 47 firms in Hampden County, 10 in Franklin and 11 in Hampshire. Between 70 percent and 80 percent (79 percent in Hampden) of these employed fewer than 100 people. Total employment was 3,930 in 1991. Plastics was 1.3 percent of total employment in Hampden and 2.3 percent in Franklin and Hampshire. This group includes manufacturers of plastic molds, film, sheet and foam products, plus a few firms which make rubber parts like hose, belting and gaskets. Some firms make consumer containers, and some make plastic housings for toys and computers. The region's industrial machinery firms provide machinery and equipment to the plastics industry. As stated above, these are basically small firms doing subcontracting, which is often quite specialized. More firms have opened up recently, and as new developments in polymer and advanced materials research at the University of Massachusetts at Amherst find commercial application, this industry could expand into a significant source of new employment.

COMPETITIVE ADVANTAGES OF THE PIONEER VALLEY REGION

Location and Infrastructure

The Pioneer Valley is favorably located. Springfield is approximately 90 miles from two state capitals (Boston and Albany) and 20 miles from a third, Hartford. Two highways, I-90 and I-91, facilitate travel through the region and connect it to larger interstate economic districts, including New York and Connecticut in the south and west, and Vermont and Canada in the north. This could facilitate international trade opportunities in this part of the state. I-91 provides direct access to employment for much of the region's population. The ability to provide easy access to a major interstate network opens up the possibility of site locations for large distribution and warehouse facilities.

With respect to accessibility by air, there are three important regional airports: Barnes Municipal Airport in Westfield, Westover Metropolitan Airport in Chicopee (also home to Westover Air Force Base), and Bradley Field International Airport. Although located across the Connecticut border, Bradley Field is the major commercial passenger airport for western Massachusetts residents (20 percent of its traffic comes from Massachusetts). Barnes and Westover are serviced by both interstates, and both can handle large aircraft. Barnes' non-military activity is mostly connected with business personal

aircraft. Westover has substantial infrastructure available from its former use as a Strategic Air Command base that could be used as a possible aircraft maintenance facility. This could provide a source of jobs for the metalworking firms currently serving the defense industry. In addition to air and roads, there is rail traffic in both east-west and north-south directions and an in-land intermodal rail center in Palmer.

Business Costs

The Pioneer Valley is attractive as a site for new business, both start-ups and recruits. It has lower industrial and office rental rates and lower industrial land use costs than either Hartford or the areas around I-495 and Route 128. The region is relatively uncongested, with room for expansion and controlled growth. The quantity and quality of the water supply represents an additional advantage. Specifically, Springfield has a large supply of water available for industrial use, which keeps the cost of water relatively reasonable.

Educational Resources

Perhaps the greatest resource for the Pioneer Valley's economy is its extraordinary array of educational institutions, as described above. The University of Masssachusetts at Amherst's Computer Science Department is among the most highly regarded in the nation, and has established a mission to develop and transfer new computing technology to existing industries as well as spinning off new firms. The Polymer Sciences Department has relationships with most of the large manufacturers in the region and also has great potential for technology transfer and new business spin-offs. The Five College area (Smith, Mount Holyoke, Hampshire, Amherst, and the University of Massachusetts) is a cultural as well as an educational center in the region. There are also some well-known private secondary schools in the area (such as Northfield Mount Hermon) that provide employment opportunities.

Work Force Skills And Availability

The Pioneer Valley's three community colleges — Holyoke Community College, Greenfield Community College and Springfield Technical Community College — have strong programs to identify the current needs of the workplace and train students to meet those needs:

- Holyoke Community College has programs in environmental education services, hotel and food management, early childhood education, and criminal justice, among others.

Perhaps the greatest resource for the Pioneer Valley's economy is its extraordinary array of educational institutions. The University of Masssachusetts at Amherst's Computer Science Department is among the most highly regarded in the nation, and has established a mission to develop and transfer new computing technology to existing industries as well as spinning off new firms. The Polymer Sciences Department has relationships with many of the large manufacturers in the region and also has great potential for technology transfer and new business spin-offs.

- Springfield Technical Community College is one of only 60 two-year colleges nationwide which are members of the National Coalition of Advanced Technology Centers, and it is the only authorized training center in the region for software and automated manufacturing technologies such as AutoCAD, CADkey, SmartCAM and others.
- Greenfield Community College has specialized in developing custom-made training programs for specific companies that it runs at the company's site. Greenfield also specializes in recreational programs and outdoor leadership, which are important parts of Franklin County's employment base. It has a high transfer rate to four-year colleges.

Quality Of Life

The Pioneer Valley is a very attractive place to live and work. It has a great deal of natural beauty, with a scenic river valley, mountain area and agricultural landscape. A large amount of open space provides residents with over 143,000 acres of park land. The Connecticut River is the region's premier natural resource and recreational asset. In addition to its natural resources, the Pioneer Valley's small cities and Springfield provide residents with cultural amenities and revitalized downtown shopping districts. There are several major tourist attractions such as the Basketball Hall of Fame, the Quadrangle Museums and the museums of the Village of Old Deerfield. The "Big E", held in Springfield, is the largest east coast agricultural fair, attracting one million visitors per year to the area. Housing costs in the area are relatively low when compared to Hartford and Boston. The median selling price of a house in the Pioneer Valley Region was $118,000 in 1990, compared with $157,300 in Greater Hartford and $174,100 in Greater Boston. Professional people from urban areas have settled in Franklin County to take advantage of its high quality of life and have started their own businesses there.

CHALLENGES TO FUTURE GROWTH

Location and Infrastructure

The downside of having open land and population increases in rural parts of the region is the problem of low-density "sprawl." Without planned development, the region will experience an increasing loss of farm-

lands, open space, scenic areas and historic resources. Existing infrastructure will be further stressed, and pollution problems will increase. While much has been done to clean up the Connecticut River, the lower reaches are still polluted by outflow from combined sewer pipes, and there is a need to upgrade wastewater treatment facilities.

Further, while good infrastructure is generally an asset for the region, certain important elements of the Pioneer Valley's infrastructure are still missing. Specifically, parts of the region are not well-connected by roads, either to Boston or to each other. The public transportation system that serves the communities abutting the I-91 corridor has meager rural components to serve outlying communities. Many small towns have limited telecommunications links as well. The area's rail system needs upgrading in order to be more useful to the paper and wood products industries as more wood is moved to Canada for processing for the furniture manufacturing industry.

Investment

Many business people in the Pioneer Valley believe that investment and credit problems are worse there than in many other parts of the Commonwealth, partly due to deficiencies in the Boston-based financial community's contact with the region. Relationships between local businesses and local banks have declined due to problems in the banking industry, and it is hard for local firms to get the financing they need to modernize their plant and equipment. Most of the region's businesses are small (employing less than 500 people) and their capital needs are also relatively small. However, because transaction costs are high for small loans, there are virtually no sources of financing that are able to make loans for less than $100,000. Large banks in the eastern part of the state are often unwilling to assume the risks of lending money to the Pioneer Valley's small businesses. Further, there is a lack of venture capital firms in the Pioneer Valley, which makes it difficult for high technology start-ups in the area to get financing.

Education

In 1991, almost 70 percent of Hampden County's population lived in 11 communities designated as having serious or critical literacy problems. This is reflected in the large number of incoming students at the region's community colleges that require remedial basic education. Another cause for concern is that there is a large population of children in the region that are at risk for learning difficulties: approximately 26 percent of the black population and 53 percent of the Hispanic population lived below the poverty level in 1989, versus 13 percent of the overall population. The Pioneer Valley possesses a large and growing number of young people who will need education, skills training and jobs to bring them out of poverty and thus improve the per capita income of the region as a whole. Another issue related to higher education is that too many students attending the region's universities leave the area upon graduation, taking their knowledge and skills with them.

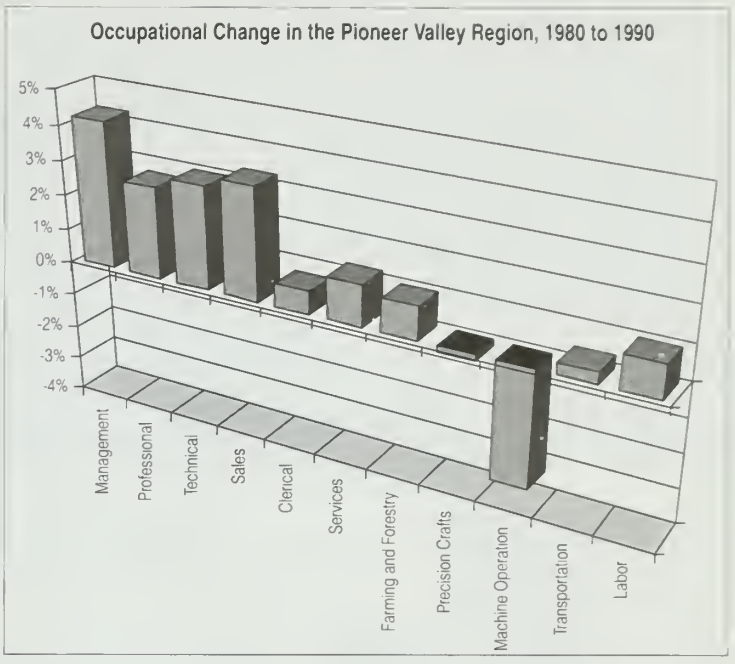


Figure 10F

Workforce Skills And Availability

The Pioneer Valley has traditionally had a larger share of total employment in manufacturing than the state as a whole, with almost 30 percent of the total workforce employed in manufacturing in 1980. By the end of the 1980s, however, one quarter of those jobs had disappeared. The service jobs that have replaced them have a 30 percent lower average wage, thus slowing the growth of the region's per capita income. The largest decline in employment by occupation was in machine operators, while the largest expansion was in management positions. See Figure10F for further information. The need to both retain manufacturing and add high-wage service jobs will affect future economic development planning. The skill base of the metalworking firms in the region needs upgrading in order to keep up with the advanced manufacturing techniques required for maintaining competitiveness.

Distressed Areas

According to the 1990 Census, 12.5 percent of the Pioneer Valley's population fell below the poverty line in 1989, compared with 8.9 percent for the state as a whole. The poverty rate in Hampden County was 13.0 percent. In Franklin County the poverty rate was 9.6 percent, and in Hampshire County the poverty rate was 10.7 percent. Springfield and Holyoke both had very high poverty rates — 20.1 percent for Springfield and 25.7 percent for Holyoke.

Both cities are under considerable stress. In addition to high poverty rates, they have high unemployment rates. In 1992, Springfield's average unemployment rate was 10.7 percent and Holyoke's was 10.3 percent, compared with the Massachusetts unemployment rate of 8.5 percent. As previously stated, both cities have large minority

populations, and their poverty rates are much higher than than that of the region's population as a whole. In 1990, the black population of Hampden County had a 25.8 percent poverty rate, while the Hispanic population had a poverty rate of 52.9 percent. The per capita income of white Pioneer Valley residents is considerably higher than that of other groups: $14,952, compared with $9,390 for blacks and only $5,690 for Hispanics. See Figures 10G and 10H.

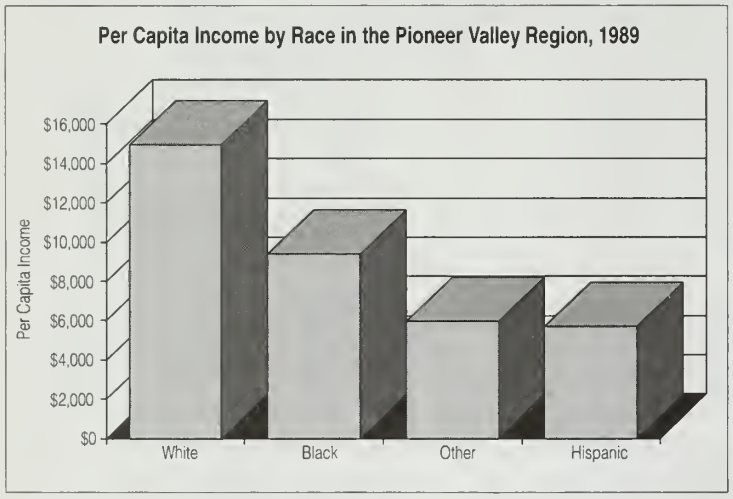


Figure 10G

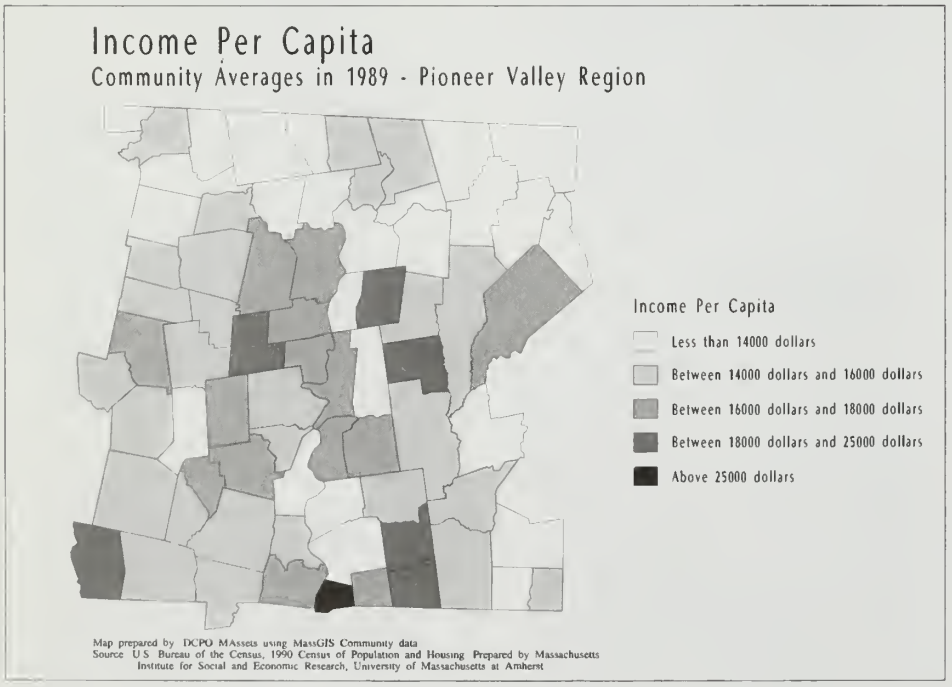

Income Per Capita
Community Averages in 1989 - Pioneer Valley Region
Income Per Capita
Less than 14000 dollars
Between 14000 dollars and 16000 dollars
Between 16000 dollars and 18000 dollars
Between 18000 dollars and 25000 dollars
Above 25000 dollars
Map prepared by DCPO MAssets using MassGIS Community data
Source US Bureau of the Census, 1990 Census of Population and Housing Prepared by Massachusetts Institute for Social and Economic Research, University of Massachusetts at Amherst

Figure 10H

Urban residents are not the only people in the Pioneer Valley experiencing economic problems. Unemployment rates are also high in some rural communities and smaller towns like Wales and Ware, many of which have experienced long-term distress. Small towns like Greenfield lost their manufacturing base a decade ago, and the jobs that are left are in relatively low-paying service occupations and retail trade. In the past 2 years, downtown Greenfield has lost several anchor stores, and the recently announced closing of the local Sears will result in another empty storefront and more people out of work. Poor communities, both urban and rural, have problems adequately funding their schools, and their poverty and unemployment rates are echoed in Hampden County's literacy rates. As mentioned, in a 1991 Regional Employment Board report on "Literacy Problems in Hampden County", the Board states that "Sixty-nine percent of Hampden County's population lives in the 11 communities designated as having serious or critical literacy problems as measured by the Literacy Problems Index".

REGIONAL POLICY PRIORITIES

Investment and Credit

There is a strong need for access to new capital in the Pioneer Valley, both for older firms trying to modernize their equipment and facilities and new spin-off companies. This is important in diversifying the region's industry base away from its reliance on defense-related customers. Community Development Corporations are sources of funds for many small businesses and entrepreneurs in the region, but they cannot make up for the lack of capaital from financial institutions. The Commonwealth has a significant role to play in encouraging banks to make loans to smaller companies in the western part of the state. Several of the programs described in this *Strategy* address these issues:

- Targeted efforts are needed to encourage bank lending, such as a Small Business Capital Access Program.
- A long-term capital gains tax cut would encourage "patient" capital.
- An Early Stage Equity Program would provide important assistance to new companies.
- An increase in the investment tax credit would help companies that need to purchase new plant and equipment.

Education

The educational performance of students in many cities and towns in the Pioneer Valley is below the statewide average. Cities and towns like Holyoke and Wales, under extreme financial stress, cannot fund their schools adequately. Furthermore, the relatively large number of poor children and children "at risk" in these school districts puts them under even more pressure.

Without a good start in life, these children will become adults who will not be able to participate in the workforce.

The region has taken steps to address these issues through the formation of the Regional Collaboration of School Superintendents encompassing Hampden and Hampshire counties. Its initial projects include putting out a regionwide directory of educational resources and holding a joint public school and business forum this April. The Pioneer Valley Planning Commission has been involved in this effort, and the Executive Office of Communities and Development has provided seed money. The Commonwealth can also help the region by providing additional funding for poor school districts (both urban and rural), upgrading the quality of public education and encouraging local businesses to join forces with schools to ensure that vocational and technical school offer appropriate curricula. The education reform efforts described in this *Strategy* address these issues:

- New resources linked to meaningful structural reform in areas like teacher training and professional development and creating a core curriculum and common assessment methods are needed to improve local school systems that are lagging behind.
- Equalizing funding between school districts on a statewide basis will ensure that even the poorest communities will have resources to provide for their children's education.
- At the preschool level, there is a great need for early childhood education to be made available to more poor and "at risk" young children.
- Innovations in vocational and technical education such as apprenticeships and tech prep programs are being pursued to improve the employment prospects of non-college-bound students.
- Rural areas within the region can benefit from new educational technologies that would link them with the educational resources of local colleges and the University of Massachusetts at Amherst.

The Pioneer Valley Region has a large number of traditional manufacturing industries such as metalworking that are adopting new technologies and methods to compete in world markets. *Photo of Major Wire in Chicopee courtesy of MIFA.*

Training

In order to succeed in reducing their defense dependency, the small metalworking shops and other local manufacturing businesses need to focus on retraining their workers to operate more modern equipment and use advanced manufacturing techniques. Most new jobs in the Pioneer Valley in the 1990s will require some kind of post-secondary education, and even basic skills will need sharpening in order for workers and employers to be successful. The Regional Employment Boards of the three counties have identified the critical industries in their areas and are involved in the creation of comprehensive workforce development plans. Several of the programs described in this *Strategy* address these issues:

- The Commonwealth is working to create a workforce development system driven by individual workers and businesses rather than by the providers of training. The system must be perfomance-based rather than procurement-driven.
- Flexible funds are needed to retrain workers in industries that are modernizing.
- The Commonwealth should help establish industry-specific representatives who will work closely with firms to articulate their training needs. This broker would work with networks of firms in critical industries to identify common training needs and to develop appropriate curricula with the firms and training service providers.

Know-How And Industrial Modernization

Manufacturing is, and will continue to be, a major employer in the Pioneer Valley. There are many older manufacturing firms that need to update their technology and training practices in order to survive and prosper. The Center for Manufacturing Productivity at the University of Massachusetts at Amherst provides engineering and management expertise to assist small and medium-size manufacturers. It has assisted 33 manufacturers with between 7 and 450 employees in activities such as human resource management and the design and development of a prototype commercial product. The superb educational resources of the region need to be utilized further to support the modernization efforts of manufacturers, and the Commonwealth can also be of assistance:

- An Industrial Extension Service, modeled on long-standing agricultural service programs, could focus the Commonwealth's resources such as training capacity and university expertise on helping small and medium-size manufacturers adopt "best practices".
- Industrial modernization will also be encouraged through an effort to improve business ties to the state college and university system in the Pioneer Valley.

Pioneer Valley Regional Profile

Infrastructure

People in the Pioneer Valley often feel that their region's economic capital needs often go unrecognized by decision-makers located in Boston. Also, the region's rural areas suffer from a lack of appropriate infrastructure, especially in water supply and treatment and public transportation and telecommunications. Some towns in the region are hampered in their attempts at industrial and commercial development due to a lack of funds for extending public water and sewer lines. The bankruptcy of Westmass has left a gap in funding for industrial park development. With respect to tourism, Springfield is continuing its Connecticut River development plans and people in the region see a need for visitor information centers along I-91 (particularly near the Basketball Hall of Fame) in order to attract the large number of travelers using the Interstate to go north to Vermont and New Hampshire. Several of the programs described in this *Strategy* address these issues:

- An Economic Development Capital Program could concentrate infrastructure funding on Pioneer Valley projects which create permanent jobs, leverage private investment and improve on local competitive advantages.
- Projects could include both large-scale capital projects with long-term regional or statewide impact and small-scale infrastructure improvements through an Economic Development Grant Program.
- The Commonwealth is working to redevelop the Belchertown State School and the Northampton State Hospital properties for commercial, industrial or other uses under a program for economic development of state-owned land.

Regulatory Environment

People who own businesses in the Pioneer Valley often feel that regulations are excessive and confusing. High health care, workers' compensation and unemployment insurance costs represent a major competitiveness issue in the region. The Pioneer Valley's close proximity to New York, Connecticut and Vermont magnifies this concern, as these states all offer more expedited approvals than the Commonwealth. The region's distance from Boston creates an added delay. Environmental and land-use regulations have made it difficult for older manufacturers in the area to find suitable and clean land for expansion or building new plants. The focus in this area should be on permit streamlining and improving accessiblity to the regulatory process. Several of the programs described in this *Strategy* address these issues:

- The regulatory process should be centralized and streamlined, with the ultimate goal to create "one-stop shopping" for permitting. The Department of Environmental Protection is strengthening its regional offices as one step to meet this need.
- The Commonwealth is working hard to lower or stabilize regulated business costs such as unemployment insurance and workers' compensation.
- Recent reforms to certain environmental regulations such as the hazardous waste cleanup law will help open more sites for development.
- The Commonwealth can help the region's manufacturers achieve pollution reductions and cost savings at the same time through toxic use reduction and energy conservation assistance.

Technology Transfer

There are new ideas coming out of the University of Massachusetts at Amherst and other local colleges that represent potential future businesses. However, the professors and students need help in bringing their ideas to market. Several of the programs described in this *Strategy* address these issues:

- New models, such as the Center for Real-Time and Intelligent Complex Computing Systems at the University of Massachusetts at Amherst, should be applied to other disciplines.
- The Commonwealth and the University should explore the creation of technology partnerships to facilitate links among and between private firms, public and private educational institutions and research centers in key Pioneer Valley industries.
- The University of Massachusetts at Amherst can market innovative processes and procedures through licensing. It should explore establishing incubator facilities focusing on special fields such as polymer sciences and advanced materials.

Defense Restructuring

The metalworking industry (fabricated metal products and industrial machinery and equipment), with approximately 350 firms and 14,000 workers in Hampden County, is heavily dependent on the defense industry, and has experienced the fallout of a reduced DoD budget. Most of these firms do not have any proprietary technology and do not have experience in producing for commercial markets. Recent layoffs at Hamilton Standard, Pratt and Whitney and other defense contractors in Connecticut have affected the Pioneer Valley economy because a number of their employees live in this area and commuted south to work. Several of the programs described in this *Strategy* address these issues:

- State agencies can provide training and adjustment programs to help defense workers prepare for other types of employment. The Massachusetts Industrial Services Program is already involved in this in conjunction with the Machine Action Project.
- State agencies can provide technical assistance to firms seeking new markets, modernizing management and production processes and conducting strategic planning. An office of Defense Diversification Coordination can help local planning officials gain access to these resources, as well as help local firms obtain federal funding.

Exports

In addition to modernization, manufacturing firms in the Pioneer Valley need to identify new markets for their products. At this point, most of these firms serve local mar-

kets: they are subcontractors for firms in Connecticut and other parts of Massachusetts. Very few have even attempted to participate in export markets. Several programs described in the *Strategy* address the need for export promotion:

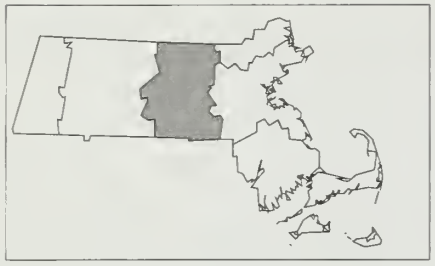
- An Export Finance Program would help the Pioneer Valley's small firms get loans to enter foreign markets.
- Technical and marketing assistance is available through the Massachusetts Office of International Trade and Investment, and would be made more accessible by the establishment of a regional center for the Commonwealth's economic development agencies in the Pioneer Valley.

Economically Distressed Areas

The Pioneer Valley has both large and small cities, as well as rural areas, which need special help. The cities of Springfield and Holyoke have large minority populations and high poverty rates. Smaller communities and rural areas are affected by their narrow employer base and narrow tax base. Several of the programs described in this *Strategy* address these issues:

- The establishment of Economic Opportunity Areas that benefit from state and local tax incentives, infrastructure investment and permitting assistance in both urban and rural areas would help create jobs in parts of the region that need them most.
- State agencies will emphasize economic development efforts in the awarding of community development funds to municipalities and Community Development Corporations.
- The Executive Office of Communities and Development should encourage community revitalization efforts by targeting microenterprise loans to both large and small cities in the region.
- The Commonwealth is working to implement reform of the hazardous waste laws, set forth in Chapter 21E of the General Laws, to encourage re-use of old industrial sites in small and large cities.

Chapter 11 Central Regional Profile



CHARACTERISTICS OF THE REGION

Geographic Description

The Central Massachusetts Region is comprised of 4 cities and 57 towns. Of these, the main economic and population centers are Worcester, Fitchburg, and Leominster. The region borders New Hampshire to the north and Rhode Island and Connecticut to the south. Worcester is the second largest city in New England and serves as the central trade and service center for the region. The region is characterized by many rivers which a century ago supplied power to the region's industrial mills. The region also has many lakes and two major reservoirs. Quabbin Reservoir, the Commonwealth's chief source of drinking water, Wachusett Reservoir, and Lake Quinsigamond are three of the region's many inland bodies of water.

Economic Overview

From an economic perspective, the Central Region is best viewed as a mosaic of its component areas:

The Worcester economy has been making the transition, over the past two decades, away from a dependence on manufacturing towards a heavier concentration of service sector jobs. Historically, the city of Worcester emerged as an industrial center due to its significance as a rail hub. Unlike other major cities in the Commonwealth which experienced growth on the basis of the production of one or two dominant products, Worcester's economic base has historically consisted of a diverse mix of industrial products. The city has been home to a number of innovations in industrial machinery and production processes. Despite employment declines, the manufacturing sector remains a significant element of the area economy, with 275 firms in the city. The past ten years have seen Worcester take the lead in making Central Massachusetts a center of biotechnology activity.

The Blackstone Valley, which includes eleven towns near the Rhode Island border, was originally developed in the nineteenth century, with huge industrial mills making use of the water power along the river corridors. Many of these mills have been put into adaptive reuse, housing businesses ranging from electronic controls to musical equipment to paint recycling. While considerable industrial diversity exists within the region, machine tools remains the largest industrial sector. This region also offers development opportunity on three other "corridors": a recently improved Route 146 highway corridor, with a future connector to the Massachusetts Turnpike; the Providence and Worcester Railroad corridor, connecting Worcester directly to a deep water port; and the Blackstone River Valley National Heritage Corridor and its evolving tourism and recreation development.

The Tri-Community area, which includes Sturbridge, Southbridge, and Charlton, stands on the shortest, most direct route between New York City and Boston. Tourism remains a strong industry in this region, focusing on Old Sturbridge Village. It is a world center of fiber optic and electro-optic research, development and manufacturing. This region also includes the towns to the west of Worcester, such as Spencer and Brookfield.

The North Central, or Montachusett, region is located at the geographic center of New England. It includes the cities of Fitchburg, Gardner, and Leominster and the surround-

ing areas. Fitchburg is the second largest city of the Central Region and has a history of manufacturing prominence in paper, fabricated metal, machinery, clothing, and plastic products. Leominster is the plastics center of the Northeastern United States, with over 100 manufacturing firms and support businesses. Gardner's major manufacturing sector had been led by the furniture industry, but now emerging technologies such as precision optics, magnetic resonance imaging and computer cable manufacturing are beginning to establish themselves there. This region is also home to Fort Devens, an Army base employing 4,600 which is scheduled to close in October, 1995. Fort Devens occupies over 9,000 acres within the towns of Ayer, Lancaster, Shirley, and Harvard.

The Route 395 Corridor includes Dudley, Oxford, and Webster and offers some of the best highway access in the state. Hundreds of acres of industrially zoned land are currently available. There are impediments to development on some parcels needing site-specific infrastructure improvements, such as water and sewer lines. Other parcels offer immediate opportunity for development.

Population Characteristics

There were 729,674 people living in the Central Region in 1990. This represents about 13 percent of the Massachusetts' total population. The area has experienced a high rate of population growth: its growth rate of 10.1 percent since 1980 is twice that of the Commonwealth's population growth as a whole. The region benefited from the economic boom in eastern Massachusetts and inflated real estate values in the suburbs west of Boston. Approximately two thirds of the population and more than 70 percent of the region's workforce are located in the Southern Worcester subregion, which includes Worcester, the Blackstone Valley, and surrounding towns. The remaining population and employment is in Northern Worcester, which encompasses the Fitchburg, Leominster, and Gardner areas. The Central Region's population is approximately 93.8 percent white, 2.2 percent black and 4.6 percent Hispanic.

The level of educational attainment in Worcester County is somewhat lower than the statewide level. Approximately 27.2 percent of the Commonwealth's residents had at least a bachelor's degree, while the same could be said for only 22.2 percent of Worcester County's residents. This is still higher than the U.S. average of about 21 percent, however, and the region's educational attainment levels have improved significantly since 1980 (See Figure 11A). This improvement correlates with increased employment in professional, management and technical occupations that generally require more years of schooling (see Figure 11B).

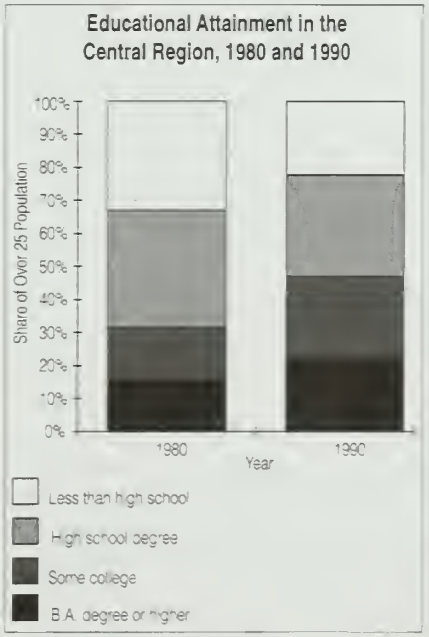


Figure 11A

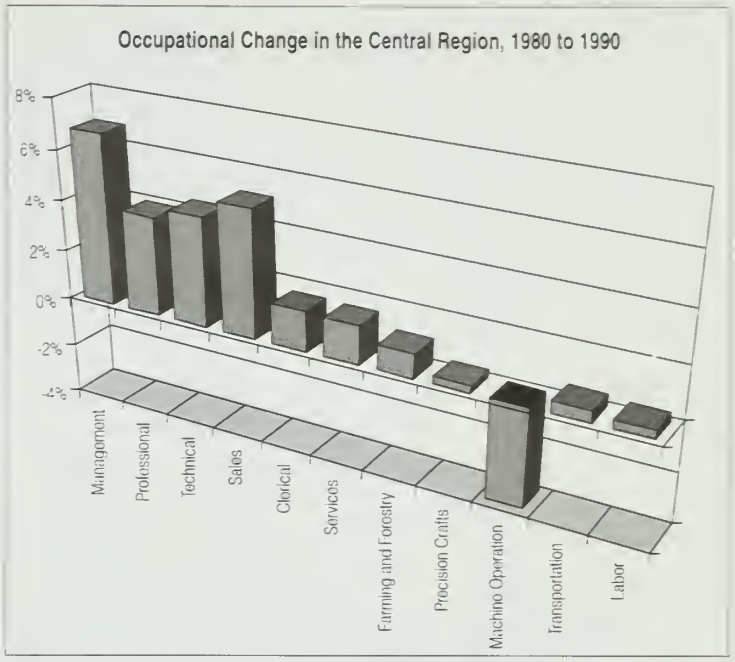


Figure 11B

Regional unemployment of 9.2 percent in 1992 exceeds the statewide rate of 8.5 percent. Over the past decade, however, unemployment rates within the region have closely paralleled the statewide rate.

The region has fared worse than the state in terms of per capita income. In 1989, per capita income in the region of $15,524 was well below the statewide average of $17,224. The region's 9.3 percent poverty rate in 1989 was slightly lower than the statewide level of 10 .1 percent. See Figure 11F for a map of per capita income by community.

INDUSTRY AND EMPLOYMENT TRENDS

Recent Developments

Population increases contributed to the prosperity of the Central Region during the mid-1980s. As population expanded, demand for new homes and local services led to an increased number of jobs in construction, retail stores, financial services and schools. The post 1988 recession, however, caused the region's economic expansion to reverse. During the period between year-end 1988 and 1991, 41,330 jobs were lost in the Central Region (See Figures 11 C and 11 D

for a breakdown of employment by major industry in that period). About 30 percent of the region's total job loss occurred in manufacturing, where employment fell by 16 percent. Manufacturing losses can be explained by lower product demand brought about by recessionary forces, as well as a decade-long restructuring in such industries as plastics and industrial machinery. Declines in base industries, combined with the drying up of the region's commercial real estate market, led to subsequent declines in local industries. Retail trade experienced job losses of 9,230, or a 16 percent decline. Construction jobs were down 50 percent, for a loss of 8,130 jobs. The least severe decline was in services, which lost 3,180 jobs (a 4.5 percent decline). While business services and social services jobs declined, health, private education and engineering services jobs actually increased during the period.

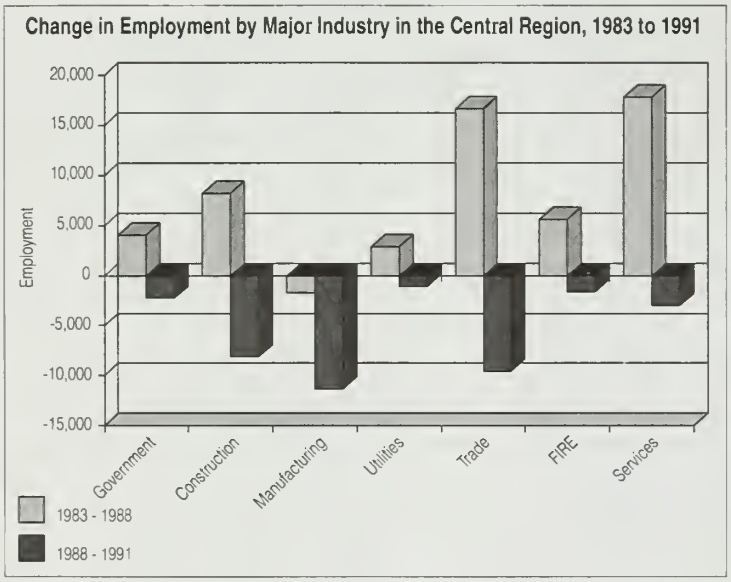


Figure 11C

Manufacturing represented 24 percent of the region's total employment in 1991, versus 17 percent of total statewide employment. Industrial machinery and equipment and fabricated metal products, the region's two largest manufacturing industries, suffered devastating losses that continued into 1992, accounting for one third of all manufacturing jobs lost in the region. In Southern Worcester, 45 percent of manufacturing job losses were in these two industries. Half of the industrial machinery and equipment job loss between 1989 and 1990 took place in the computer equipment industry, due primarily to layoffs at Data General and Digital Equipment Corporation. Both of these companies have been beleaguered by rising competition throughout the industry and a structural decline in demand for minicomputer systems. In Northern Worcester, 74 percent of manufacturing job losses took place in furniture, miscellaneous plastic products and communications equipment. Employment in furniture, an industry highly concentrated in the Gardner area (with 22 percent of the industry's statewide jobs), dropped by 45 percent from 1988 to 1991, due to a downturn in new home construction.

Critical Industries

In the Southern Worcester area, industries that are important to the region due to the new money they bring in (i.e. they have above average regional concentration) are computers and office equipment, biotechnology and medical instruments (especially opthalmic products), nursing care facilities and insurance. Wages in the insurance industry and in computers and office equipment are above average, while nursing care wages are below average. Other manufacturing industries heavily concentrated in Southern Worcester include plastics, primary and fabricated metals, industrial machinery, apparel and textiles, and defense-related manufacturing. Wages in these sectors tend to be above average.

In the Northern Worcester area, industries that have above average regional concentration include computers and office equipment, telecommunications equipment, wholesale drugs, nursing care facilities and credit unions. Other manufacturing industries with high regional concentrations include rubber and plastic products, industrial machinery and equipment, printing and publishing, food products, defense-related manufacturing and chemicals. Wages are above average in all of these sectors, with the exception of nursing care facilities and credit unions.

Critical industries identified by the Regional Employment Boards as having future growth potential for the Central Region include plastics, health care services and biotechnology, and fiber optics.

Industry Profiles

Health Care

Health care is the largest employer in the Central Region. With over 35,000 employees, the industry accounts for about 13 percent of total employment in the region. Employment in health services increased nearly 5 percent between the fourth quarter of 1988 and the fourth quarter of 1991 due to growth in medical doctors' offices, health care clinics, and nursing and personal care facilities.

The region's largest employer is the University of Massachusetts Medical Center in Worcester, employing 5,700 people. Its presence establishes the region's health care services as an "export industry". The Medical Center generated over $31 million in National Institutes of Health research funding in both 1991 and 1992, and serves as a driving force in the region's biotechnology research industry.

As the population of the region ages, home health care services should continue to expand. There are two major hospital expansions proposed, the Medical Center of Central Massachusetts, and the Fallon/St. Vincent "Medical City," a $150 million dollar, 625,000 square foot medical complex in downtown Worcester to be completed in 1997.

Central Regional Profile

CENTRAL REGION
EMPLOYMENT BY MAJOR INDUSTRY
1988 Fourth Quarter - 1991 Fourth Quarter

INDUSTRY	EMPLOYMENT CHANGE 1988-1991 FOURTH QUARTER 1988	1991	NET CHANGE	PERCENT CHANGE	PERCENT OF 1991 TOTAL EMPLOYMENT
TOTAL EMPLOYMENT	315,560	275,430	(40,130)	-12.7%	100.0%
TOTAL PRIVATE EMPLOYMENT	281,100	233,070	(48,030)	-17.1%	84.6%
AGRICULTURE, FORESTRY, & FISHING	1,970	1,440	(530)	-26.9%	0.5%
MINING	190	160	(30)	-15.8%	0.1%
CONSTRUCTION	16,240	8,110	(8,130)	-50.1%	2.9%
MANUFACTURING	75,760	63,480	(12,280)	-16.2%	23.0%
Printing & Publishing	6,420	5,770	(650)	-10.1%	2.1%
Stone, Clay, & Glass Products	4,910	4,240	(670)	-13.6%	1.5%
Fabricated Metal Products	9,350	7,970	(1,380)	-14.8%	2.9%
Industrial Machinery & Equipment	15,750	12,680	(3,070)	-19.5%	4.6%
Instruments & Related Products	5,100	4,640	(460)	-9.0%	1.7%
Paper & Allied Products	3,810	3,180	(630)	-16.5%	1.2%
TRANSPORTATION & PUBLIC UTILITIES	13,500	12,270	(1,230)	-9.1%	4.5%
Electric, Gas, and Sanitary Services	3,330	3,570	240	7.2%	1.3%
WHOLESALE TRADE	16,870	15,270	(1,600)	-9.5%	5.5%
Durable Goods	8,680	7,350	(1,330)	-15.3%	2.7%
Nondurable Goods	8,190	7,920	(270)	-3.3%	2.9%
RETAIL TRADE	58,250	49,020	(9,230)	-15.8%	17.8%
General Merchandise Stores	5,500	4,670	(830)	-15.1%	1.7%
Food Stores	10,530	9,830	(700)	-6.6%	3.6%
Eating & Drinking Places	16,970	15,000	(1,970)	-11.6%	5.4%
Misc. Retail	8,820	7,850	(970)	-11.0%	2.9%
FINANCE, INSURANCE & REAL ESTATE	17,310	14,560	(2,750)	-15.9%	5.3%
Insurance Carriers	6,330	6,220	(110)	-1.7%	2.3%
SERVICES	71,020	67,840	(3,180)	-4.5%	24.6%
Business Services	11,180	8,490	(2,690)	-24.1%	3.1%
Health Services	25,660	27,360	1,700	6.6%	9.9%
Educational Services (private)	5,640	6,110	470	8.3%	2.2%
Social Services	7,110	6,500	(610)	-8.6%	2.4%
Engineering & Management Services	4,660	4,810	150	3.2%	1.7%
FEDERAL	5,010	4,770	(240)	-4.8%	1.7%
STATE	11,730	12,330	600	5.1%	4.5%
Health Services	4,880	5,270	390	8.0%	1.9%
Educational Services	3,853	3,973	120	3.1%	1.4%
LOCAL	27,710	25,250	(2,460)	-8.9%	9.2%
Health Services	1,310	670	(640)	-48.9%	0.2%
Educational Services	16,900	15,850	(1,050)	-6.2%	5.8%

SOURCE:Massachusetts Department of Employment and Training, Employment and Wages/ES-202.
NOTES:Data represent jobs covered by Unemployment Insurance laws. Data are not adjusted for non-economic changes in industry or geographic coding that may have occurred between the comparative periods.
C= CONFIDENTIAL DATA N.E.C.= NOT ELSEWHERE CLASSIFIED

Figure 11D

Central Regional Profile

Biotechnology

Biotechnology research and development has emerged as a major growth industry in Central Massachusetts over the last few years. The Massachusetts Biotechnology Research Park, located on 75 acres of land in Worcester adjacent to the University of Massachusetts Medical Center, represents the first major location of this high technology industry in the area. Currently, 18 companies employing 1,440 people are located at the Park. This represents a private investment of approximately $180 million. When fully occupied, developers estimate that over 4,000 jobs will be created as a result of $455 million in private investment.

BASF Corp., a multi-national chemical and health care company, is constructing a $100 million research facility at the Park. Cancer research and diseases of the immune system will be the major focus of work at the research facility. Upon completion in 1993, the facility will employ approximately 500 people, and within ten years, the company expects to employ 1,000 people.

Given the success of this facility, other parks are being developed to accommodate continued investment in additional biotechnology-related research, development, production and manufacturing ventures. These ventures include: a biotechnology park at the Tufts University Veterinary School in Grafton; a Grafton Biotechnology Park proposal being developed by the Worcester Business Development Corporation on state-owned land; a private technology park development in West Boylston; the proposed Worcester/Millbury Industry Park; and the Foundation Park in Shrewsbury at the Worcester Foundation for Experimental Biology.

Cambridge BioTech Corporation has recently announced plans to build their diagnostics manufacturing facility at Shrewsbury's Foundation Park. The facility is expected to employ between 100 and 125 upon completion in 1994.

Not all biotechnology activity in the region is focused on health care. Substantial progress also is being made in the areas of environmental cleanup and agriculture.

Educational Services

Educational services was the second largest employer in the region in 1991, employing close to 16,000. There are 15 institutions of higher education in the Central Region. This includes two private two year colleges and two community colleges each offering certificate and associate degree programs in a variety of fields. There are nine four-year colleges offering graduate and undergraduate degree programs. In addition, this region has the University of Massachusetts Medical Center, a medical school and graduate school of biomolecular science which also sponsors continuing education programs for physicians, nurses and other health-care professionals. Tufts University School of Veterinary Medicine is the only veterinary school in New England. The Worcester Consortium, made up of ten of these colleges, accounts for 18,000 full-time and 13,000 part-time students. In the 1990-1991 academic year, 38 percent of the full-time students in Worcester's higher education institutions came from outside the state, establishing the region as an education "exporter".

Plastics

Massachusetts ranks in the top ten states in the country in terms of plastics processing plants, many of which are located in the Central Region. The United States plastics industry got its start in Leominster with the manufacturing of plastic combs in the early 1930s, and the Leominster area is still home to over 100 manufacturers of plastic products.

In the fourth quarter of 1991, there were 7,109 people employed in the plastics industry in the Central Region, a 17 percent decline from 1988 employment of 8,561. Major employers in the industry include: Flexcon, a 750 employee manufacturer of plastic products and laminating based in Spencer; the E.B. Kingman Company, a 250 employee producer of plastic injection molding based in Leominster; and Tucker Housewares, a 425 employee manufacturer of plastic housewares in Leominster.

While the plastics industry has undergone restructuring over the past decade, the Central Region's high concentration of firms represent the nation's most advanced technology in the industry. Increased production efficiency combined with the existence of a large pool of highly skilled labor makes industry prospects appear favorable. Firms within the region are able to draw from the area's strong pool of skilled labor to continually upgrade production processes and develop new and innovative products. The plastics industry also benefits from a network of specialized suppliers in the region.

While the Central Region's plastics industry faces high costs in terms of labor and regulatory compliance, it is able to compete globally through diversification of product end uses and diversification of functions within the industry. The region has a strong network of firms involved in each phase of the plastics manufacturing process: polymer producers, polymer molders, manufacturers of molding machinery and mold makers.

Industrial Machinery and Equipment

The industrial machinery and equipment industry is the largest industrial employer in the region. Employment of 16,330 in the industry in the fourth quarter of 1991 represents a 17 percent decline from the 1988 level of 19,720. Major employers in the industry include the Morgan Construction Company, a 500 employee Worcester-based manufacturer of rolling mills and powerstacks; the General Electric Navy & Small Steam Turbines Division, which employs 850 people in its Fitchburg facility in the production of steam turbine drivers for utility, Navy and Marine use; and Reed Rolled Thread Die Company, a 400 employee manufacturer of thread rolling machines in Holden.

Within the industry there is a concentration of firms which focus on metal cutting and metal forming machine tools. These firms manufacture a wide variety of products such as tool and dies, grinding machines, and machine tool parts. Worcester County is

home to 27 percent of the Commonwealth's industrial machinery producers.

Many firms within the industry are defense contractors or subcontractors, making the industry vulnerable to current defense spending reductions. General Electric's Navy and Small Steam Turbines Division is the region's largest defense prime contractor, accounting for $101 million of the region's $195.5 million in prime contracts in 1991. This division of GE has been making a transition over the past four years towards a greater concentration in turbine production with commercial end uses. Other large contractors in the region include Millipore in Milford, which manufactures filter apparatus, and Warren Pumps in Warren, which manufactures industrial pumps with military applications.

Fabricated Metal Products

Worcester County accounts for the highest concentration of fabricated metal firms statewide, with 24 percent of the Commonwealth's total in 1991. Employment in the fabricated metal products industry was 7,970 in the fourth quarter of 1991. Employment within the industry in the southern half of Worcester County alone accounts for over 16 percent of total industry employment in the state. The fabricated metals industry experienced substantial downsizing during the mid to late 1980s. Between 1988 and 1991, the industry's employment declined 15 percent. Major employers include Hyde Manufacturing Company, an 800 employee Southbridge-based manufacturer of industrial hand and machine putty knives; Simonds Industries, a 1,000 employee manufacturer of cutting implements in Fitchburg; and Parker Metal Corporation, a 400 employee Worcester-based producer of metal fasteners, nails and screws.

The industry has close ties with the region's plastics industry. Moldmaking shops depend on metalworking products to create complex molds with sophisticated design work. Other sources of demand for metal products are machine tools, aerospace and defense. A 1991 survey of metalworking shops statewide revealed that aerospace and defense are the metalworking industry's largest customer. Wyman-Gordon Company, a 3,000 employee Worcester-based manufacturer of ferrous forgings for the aerospace industry, is a major defense subcontractor. The industry's dependence on defense contracts makes it vulnerable to cutbacks in the defense budget.

The industry has moved in recent years to stressing quality and service over price. Using cutting-edge production technologies, many manufacturers have moved toward specialized, high precision metalworking. Improving technology and machinery requires upgrading the skills of the industry's workforce, which is a challenge for companies in the region.

Central Massachusetts is within a one hour drive from 6 million people living in the Boston, Providence, Springfield and Hartford metropolitan areas: 9.2 million people live within 75 miles of Worcester. This enormous market is made even more accessible by the region's excellent transportation systems.

Optical Technology

The fiber optic technology industry is an important presence in the Tri-Community Area (Sturbridge, Southbridge, Charlton) in Southern Worcester. Applications of fiber optics are in communications, electronics, medical instruments, scientific instruments, and other industrial and military fields, with the greatest growth potential in the communications area. Several of the companies experienced layoffs in 1990 and 1991 due to cutbacks in military contracts. Galileo Electro-Optics had to lay off 200 workers in 1991, but has been a leader in diversifying its product base and targeting growth commercial markets.

South Worcester County is also home to a concentration of optical companies, mostly spin-offs of the American Optical Company. The majority of the industry's employment is concentrated in the Southbridge area. Most of the jobs are in the manufacturing of optical instruments and lenses, and opthalmic goods.

Insurance

Insurance carriers employed over 6,000 people in the Central Region in the fourth quarter of 1991. The industry experienced only a slight employment decline between 1988 and 1991. Major employers in the industry include State Mutual Life Assurance Co., Hanover Insurance Co., Paul Revere Insurance Group, and Commerce Insurance Company. Employment in these firms ranges from roughly 875 to 2,000. State Mutual and Paul Revere are national providers of life insurance and related products. Hanover is a national provider of property and casualty insurance, while Commerce is the Commonwealth's largest supplier of automobile insurance.

Furniture

Employment in the furniture industry was 1,570 in 1991. Most of this employment is located in Gardner, which at one time was one of the nation's primary centers for furniture making. The furniture industry has undergone a rapid decline over the past 20 years: between 1970 and 1985, employment in the industry decreased by 50 percent compared with a 29 percent decline nationwide. Gardner and other areas lost ground to larger competing furniture clusters such as North Carolina. Southern manufacturers had better access to raw materials, growing markets, and were better able to upgrade physical capital and develop new product lines. Since 1985, the industry has experienced additional employment declines. Recent job losses can be explained by the closing of two companies: Collier Keyworth, a manufacturer of office furniture

parts, and Temple Stuart, a household furniture manufacturer.

COMPETITIVE ADVANTAGES OF THE CENTRAL REGION

Location and Infrastructure

Central Massachusetts is within a one hour drive from 6 million people living in the Boston, Providence, Springfield and Hartford metropolitan areas: 9.2 million people live within 75 miles of Worcester. This enormous market is made even more accessible by the region's excellent transportation systems. This extensive ground transportation system includes the Massachusetts Turnpike, Interstates 290, 395, 495 and 190, as well as Routes 2, 9, and 146. This highway system also moves freight through 111 common carrier trucking lines and 50 freight terminals, making Central Massachusetts an ideal location for distribution activities and facilities.

Conrail and the Providence and Worcester Railroad provide rail freight service. Worcester has a U.S. Customs bonded intermodal terminal providing efficient linkage for rail and motor carriers, and warehouse and distribution services throughout New England. Worcester is now an access terminal via rail to deepwater ports in Rhode Island and the West Coast through the "Port of Worcester," which is one of the Region's most significant transportation developments in recent years.

Worcester Airport has continued to expand its facilities. The airport was upgraded in 1986 by the General Aviation Administration to a Primary Airport, the highest service classification. Improvements to the airport which will attract new airline service include the current construction of a $10 million terminal building and a new instrument landing system. Worldwide freight service is provided at the airport by Euro-American Air Freight Forwarding. Worcester Airport also has a commercial heliport and several charter services. In addition to the Worcester Airport, the southern half of the region benefits from its close proximity to T.F. Green Airport in Warwick, Rhode Island and Bradley International Airport in Windsor Locks, Connecticut. The region is also served by Boston's Logan International Airport, reached from eastern parts of the region in about one hour.

Educational Resources

Several of the 15 higher education institutions in the Central Region have programs that educate and train students to participate in the growing health and biotechnology sector. These include the University of Massachusetts Medical School, Worcester Polytechnic Institute, Holy Cross, and the Tufts University Veterinary School. Tufts is the only school in New England with a biology and animal science department, and is currently doing research with 40 biotechnology companies. In addition, Becker College, a two year school in Worcester, offers an undergraduate concentration in biotechnology and a certificate program that trains adults currently working in biotechnology companies. These institutions come together regularly to share ideas. Further, some of them run a variety of teacher training programs to increase the existing skills of math and science teachers in the public schools. Over 200 teachers have taken these programs in the past two years.

Technology Transfer Resources

The Central Region also benefits from the existence of several facilities involved in the transfer of research technology to commercial applications. These include:

- The Center for Technology Commercialization, sponsored by NASA, focuses upon the commercialization of technology developed by the federal government.
- The Massachusetts Biotechnology Research Institute has established a United Office of Technology Transfer to evaluate the commercial potential of technologies developed within its participating institutions. The firms at the Massachusetts Biotechnology Research Park utilize the resources of the University of Massachusetts Medical Center and the efforts of the Massachusetts Biotechnology Research Institute to commercialize technologies developed within the industry.
- The New England Regional Biotechnology Transfer Center at the Tufts University School of Veterinary Medicine in Grafton supports ongoing and expanded cooperation with private industry in New England.

Workforce Skills and Availability

The Central Region benefits from a large pool of skilled labor in such key industries as plastics, machinery and fabricated metals. The high concentration of firms within these industries, most involved in the production of specialty products, illustrates the diversity and depth of skills in the labor force. While additional training is needed to orient this labor force to new technology and processes, it already has an important base of specialized skills and knowledge in these industries (See Figure 11E for an occupational breakdown in the region).

CHALLENGES TO FUTURE GROWTH

Location and Infrastructure

While the region currently benefits from a strong network of highways, the critical

Occupational Distribution in the Central Region & Massachusetts, 1990

	Central	State
Management	13.4%	14.6%
Professional	16.0%	17.4%
Technical	4.2%	4.2%
Sales	10.7%	11.4%
Clerical	16.9%	17.3%
Services	12.6%	12.8%
Farming and Forestry	0.9%	0.9%
Precision Crafts	11.2%	10.0%
Machine Operation	7.3%	5.6%
Transportation	3.5%	2.9%
Labor	3.3%	3.0%
Total	100%	100%

Figure 11E

Central Regional Profile

highway and rail links from Worcester to Boston are weak. In terms of highway transportation this situation is being corrected by the Route 146/Massachusetts Turnpike project. The project, scheduled to begin in 1995, will provide direct access from the Pike to the city of Worcester. In addition, commuter rail service will be brought to the region through the 23-mile extension of service from Framingham to Worcester.

Workforce Skills and Availability

Emerging high technology industries in the region such as biotechnology and fiber optics depend upon a well educated labor pool with the ability to adapt to changing technologies. Similarly, the region's traditional industries such as plastics and industrial machinery are increasingly reliant upon an educated labor pool with the flexibility required for constant retraining in the use of higher technology production processes.

Richard Flanagan, President of the Leominster-based mold maker Stan-Cast, cites the maintenance of worker skill levels in a constantly changing industry as the most important concern for plastics manufacturers in the region. There are currently no training programs which adequately prepare workers for high technology production processes. The North Central Massachusetts Regional Employment Board cites a critical need for skilled mold and plastics technicians.

Consistent Land Use Planning

The challenge for planners in the Central region will be in establishing a unified, consistent development plan for the region. The region's "edge cities" currently have available a large supply of developable land with highway access. The widening of Route 146 and creation of a Route 146/Mass Pike interchange will lead to an increased supply of available industrial land. While this new developable land offers attractive access to transportation networks, it also requires extension of water and sewer lines. The Central Region must guard against haphazard development, which will lead to inefficient use of physical infrastructure resources. Efforts must be made to balance the redevelopment of sites with existing access to sewer and water, and development of vacant industrial land.

Defense Restructuring

The closing of Fort Devens in 1995 will mean the loss of over 6,400 jobs for the region in direct military personnel alone, with even greater losses when the impact to the local service economy is considered. The region must work to counterbalance those losses. In addition to the new intermodal facility, the Army has accepted plans submitted by the Federal Bureau of Prisons to site a federal prison medical center, a 1,600-bed low-security prison, and a 500-bed detention center. The prison will create an estimated 850 jobs, with an annual payroll of approximately $22 million. Other possible federal government uses would be to house and train Reserve Units or regional headquarters of the Army Corps of Engineers. The Commonwealth, in cooperation with the Massachusetts Government Land Bank, is currently investigating possible additional future uses for the base.

Distressed Areas

The region faces the challenge of creating broad economic opportunity for all residents within its subregions. There are pockets of distressed areas within the region that have historically fared worse than the region as a whole. Some of the Central Region's medium and larger size cities have experienced long-term employment declines due to the erosion of the traditional manufacturing base over the past 40 years. This decline has led to blighting conditions and many vacant mill buildings in areas of such cities as Worcester, Fitchburg, and Gardner. The region's small towns and rural areas have also historically faced economic difficulties. Rural areas are at a disadvantage due to their poor access to major employment centers.

In 1989, Worcester County had a per capita income of $15,500, which was below the statewide average of $17,224. Three of the county's four cities, Fitchburg, Gardner, and Worcester, had per capita incomes lower than even the county average, with per capita incomes of $12,140, $13,207 and $13,393, respectively. Four towns — Brookfield, Royalston, Southbridge, and Warren — had the county's five lowest per capita incomes, all of which were less than $13,000. Figure 11F shows variations in per capita income by community in the region.

According to the 1990 census, 8.3 percent of all households in Worcester County fell below the poverty level — slightly lower than the statewide average of 8.9 percent. However, three of the county's four cities, Fitchburg, Gardner, and Worcester, exceeded the statewide poverty rate, with poverty rates of 14.0 percent, 11.0 percent and 15.3 percent, respectively. Some smaller towns also face high incidences of poverty, such as Southbridge with a rate of 11.7 percent.

The unemployment rates for many parts of the region have been higher than the statewide average for the past few years, and certain individual towns and cities had among the highest unemployment rates in the state. Compared to a statewide unemployment rate of 8.5 percent in the January to November 1992 period, Hubbardstown had a rate of 16.1 percent, while Templeton, Phillipston, Southbridge, Blackstone, Winchendon, and Warren all had rates exceeding 12 percent. Of the region's larger communities, Gardner experienced an 11.8 percent rate, while Fitchburg and Leominster were at 10.3 and 9.9 percent, respectively.

REGIONAL POLICY PRIORITIES

Investment

The region's mature industries such as metalworking and plastics are faced with the need to upgrade their equipment. In addition, growth industries such as biotechnology and fiber optics need equity capital for new product development. Several of the programs described in this *Strategy* address these issues:

- The proposed Emerging Technology Fund would promote investment and in

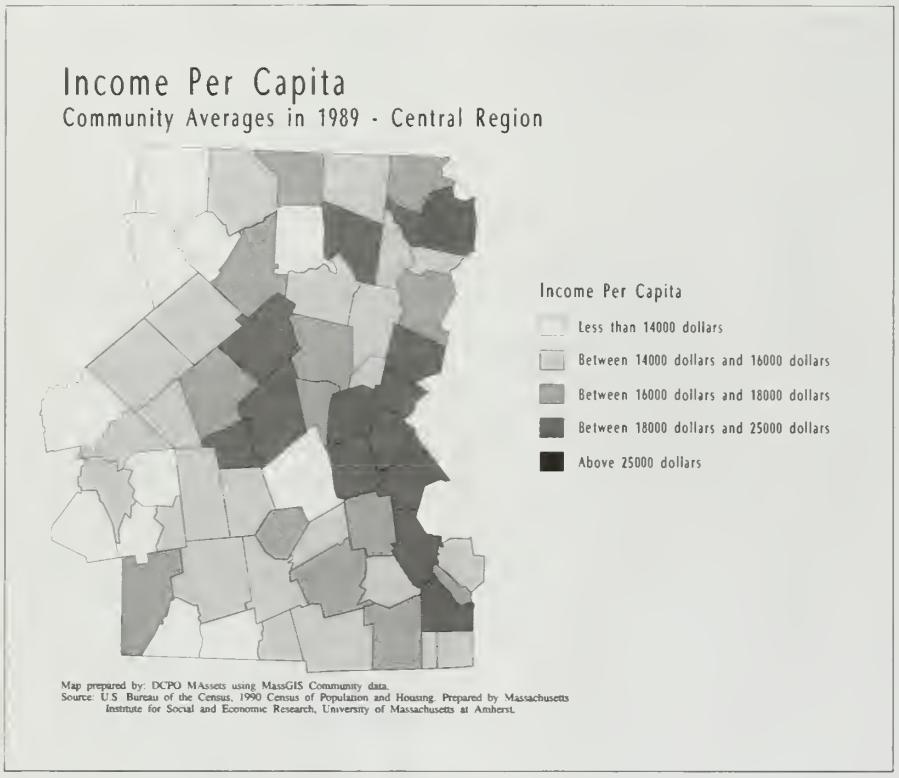

Income Per Capita
Community Averages in 1989 - Central Region
Income Per Capita
Less than 14000 dollars
Between 14000 dollars and 16000 dollars
Between 16000 dollars and 18000 dollars
Between 18000 dollars and 25000 dollars
Above 25000 dollars
Map prepared by: DCPO MAssets using MassGIS Community data.
Source: U.S. Bureau of the Census, 1990 Census of Population and Housing. Prepared by Massachusetts Institute for Social and Economic Research, University of Massachusetts at Amherst.

Figure 11F

new facilities by industries such as biotechnology, which require expensive research and manufacturing facilities that are hard to finance.

- An increase in the investment tax credit would have a significant impact on investment in plant equipment.
- A Small Business Capital Access Program would reduce the risk associated with small business loans and increase the availability of working capital to the region's smaller firms.

Education

The region's public education system currently faces the burden of accommodating students who speak English as a second language. Minority populations within the region's urban areas exceed statewide averages. According to the 1990 Census, people of Hispanic origin represent 4.7 percent of the Commonwealth's population, while, Worcester, Leominster, and Fitchburg all have Hispanic populations exceeding 8 percent.

Some of the communities in the region, particularly some rural towns, are experiencing difficulty in funding local education and in providing the basic skills that are needed by students for work in the region's growth industries. The state's education reform proposals described in this *Strategy* address these issues:

- The creation of a core curriculum and statewide performance standards, combined with meaningful structural reform in areas like teacher training and school management will allow the Central Region's communities to dramatically improve their schools.
- Expanding funding for school districts on a statewide basis will ensure that even the poorest communities will have resources to provide for their children's education.
- Innovations in vocational and technical education such as apprenticeships and tech prep programs are being pursued to improve the employment prospects of non college-bound students.
- Expansion and improvement of the use of technology in education can bring new opportunities to all schools in the region, but especially those in more rural communities.

Training

The need for industry specific training programs has been cited in the region for both traditional manufacturers in such industries as plastics and fabricated metals, as well as for emerging industries such as biotechnology. The Plastics Advisory Council, a consortium of local plastics manufacturers, is currently working with area vocational schools in identifying the training needs of the industry. The MassJobs Council is working with the area's Regional Employment Boards to define specific training needs of the region's critical existing and emerging industries. Several of the programs described in this *Strategy* address these issues:

- The Commonwealth is creating a worker training system which is driven by the needs of the region's industries. In such a system, representatives for such industries as plastics and fabricated metals would act as a liaison between both firms and educational institutions.
- The region's community colleges, Mount Wachusett Community College and Quinsigamond Community College, would be called upon to provide additional training and certificate programs which meet the specific needs of many of the region's industries.

Infrastructure

The region currently faces several key infrastructure concerns. These include inadequate transportation links from Worcester to Boston, the need for sewer and water links to developable industrial land, and the need to find additional future uses for Fort Devens. Several of the programs described in this *Strategy* address these issues:

- The Commonwealth is currently involved in the creation of a Route 146-Mass Pike

interchange and the widening of sections of Route 146 between Millbury and Worcester. The project will greatly improve access from the Massachusetts Turnpike to the City of Worcester. A preliminary design and environmental impact study is underway.

- The proposed 23 mile extension of commuter rail service from Framingham to Worcester will connect downtown Worcester and several other communities in the region with downtown Boston. One stop is proposed for Grafton's medical research park.
- In 1993, the Commonwealth will begin $5 million of improvements to access ramps for Route 290 in downtown Worcester, which will alleviate existing safety problems and facilitate traffic flow to the downtown area.
- In July of 1992, Governor Weld announced the creation of a new intermodal facility at Fort Devens. The facility will link rail lines currently owned by Canadian Pacific and Springfield Terminal/Boston & Maine, allowing direct rail transportation from the port of Boston to Chicago and Vancouver. The intermodal facility would establish Fort Devens as a prime location for industrial development.
- The Economic Development Capital Program could provide funding for major state capital projects with long term economic development potential. An example might be the conversion of Fort Devens to commercial uses.
- The Economic Development Grant Program could act as a quick response fund for smaller scale infrastructure improvements. Possible projects to be funded would be improved highway access and utility links to industrial land.

Regulatory Environment

The region's manufacturers, particularly in plastics, face problems in complying with environmental regulations due to the nature of their production processes. Yet most manufacturers are relatively small and do not have staff that is knowledgeable in these issues. Further, Central Massachusetts' urban areas have a large supply of developable mill buildings well served by utilities and highways. Unfortunately, their development is constrained by the cost and difficulty of compliance with the state's hazardous waste law. Several of the programs described in this *Strategy* address these issues:

- Massachusetts must centralize and streamline its permitting process. The ultimate goal is to institute "one-stop shopping" for permitting, with clearly established requirements and deadlines.
- The state's Toxic Use Reduction Service will work with Central Region companies to restructure their manufacturing processes, allowing them to produce less waste, save money, and comply with strict environmental standards.
- Reform of Chapter 21E, the State law regulating hazardous waste at industrial sites, is being implemented to allow for the redevelopment of existing industrial sites found throughout the region.

The Massachusetts Biotechnology Research Park in Worcester has helped create a fast-growing biotech industry in the Central Region. The clustering of research institutions, an incubator, and a number of cutting-edge companies on one site spurs innovation and growth.

Photo taken by Chnstopher Navin, courtesy of The Massachusetts Biotechnology Research Park.

Know-How

The Central Region must continue drawing from its strong research centers to develop new products and production technologies. The region's key industries such as plastics, biotechnology, and metalworking require constant upgrading of production and management techniques in order to remain competitive in national and international markets. Several of the programs described in this *Strategy* address these issues:

- An Industrial Extension Service could unite current disjointed programs and focus their resources on small and medium sized manufacturers in the region. Services provided could include identification of proven process technologies and methods, and ties to research programs, training, financial and regulatory assistance programs, and export programs.
- The Commonwealth should also promote know-how and industrial modernization through increased efforts to improve business ties to the state university and college system.

New and Small Businesses

The region, like the state in general, has experienced substantial employment declines in its base industries. The region has a heavy concentration of mature industries such as plastics and industrial machinery and equipment, which have both experienced double-digit employment declines over the past three years. The region must promote entrepreneurial energies and growth in emerging

industries in order to retain and expand its job base. Several of the programs described in this *Strategy* address these issues:

- An Early Stage Equity Financing Program would help the region's new companies to obtain the "patient capital" which is of critical need to new firms.
- Proposed regulatory reforms will simplify the permitting process, which is currently both costly and time-consuming for the region's small businesses.
- Improvements in technology transfer will help create new companies.

Export Promotion

Firms within the region need help in identifying export markets and financing assistance for export transactions. Export assistance might prove particularly useful to small fiber optics and plastics firms in the region, which are involved in specialty markets. Several of the programs described in this *Strategy* address these issues:

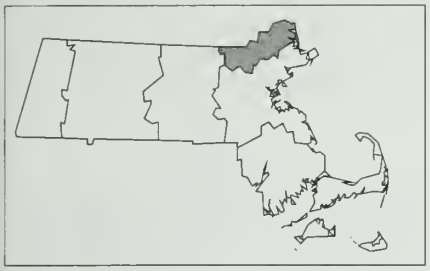
- Export guarantees are necessary to address the lending risk problem that prevents firms from obtaining short-term bank loans based on export orders.
- The Massachusetts Office of International Trade and Investment provides Massachusetts companies with a host of programs, services and institutional functions that support and facilitate expansion into foreign markets.
- Trade missions have been extremely successful in raising awareness of export opportunities and in helping individual companies gain access to foreign officials in order to negotiate a contract or penetrate a new market.

Economically Distressed Areas

The existence of wide variations in economic status among the region's residents has been cited as a challenge to the Central Region. Several of the programs described in this *Strategy* address these issues:

- The proposed Economic Opportunity Areas would encourage investment in the region's rural and urban areas through a combination of tax incentives and financing tools to facilitate infrastructure development.
- Several programs exist which target investment to distressed areas. These include a venture capital fund and a small loan guarantee program administered by the Community Development Finance Corporation for urban areas, and several programs at the Executive Office of Communities and Development that focus resources on smaller communities.

Chapter 12 Northeast Regional Profile



CHARACTERISTICS OF THE REGION

Geographic Description

The Northeast Region of Massachusetts borders the State of New Hampshire to the north, the Atlantic Ocean to the east and Greater Boston to the south. Comprised of the northern parts of Middlesex and Essex Counties, the region contains four cities and nineteen towns. Of these, the two main urban and economic centers are Lowell and Lawrence. Lowell, with its surrounding communities of Billerica and Chelmsford, comprises approximately 32 percent of the region's population and 34 percent of total employment. Lawrence, Haverhill, and Andover constitute a further 28 percent of the Northeast's population and 23 percent of its employment. Both regional centers lie approximately 25 miles from Boston and 220 miles from New York City.

Economic Overview

The Northeast Region has traditionally had an economy characterized by a high concentration of manufacturing. Nearly 32 percent of the region's employment is in manufacturing industries — a figure which far exceeds the statewide figure of 17.3 percent. Services are meanwhile markedly less important to the Northeast than they are to the state as a whole. Services provide only 23 percent of the region's employment, in contrast to 30.6 percent of statewide employment. The loss of a large number of manufacturing jobs over the past few years due to structural problems in the computer and defense-related industries has, however, increased the relative importance of service jobs (See Figure 12A). There are, therefore, some signs that the Northeast economy is gradually conforming to the pattern of a declining manufacturing base seen in many other parts of the state.

Despite its large size in relative terms, the Northeast's manufacturing sector is not very diversified. Computers, communications, and military missile equipment account for the vast majority of manufacturing in the region. In the Northern Middlesex area, for example, more than 40 percent of manufacturing employment is located in the computer industry. As measured by relative employment share, the computer industry has nearly seven times as great a presence in this part of the region as in the state as a whole. The production of communications and guided

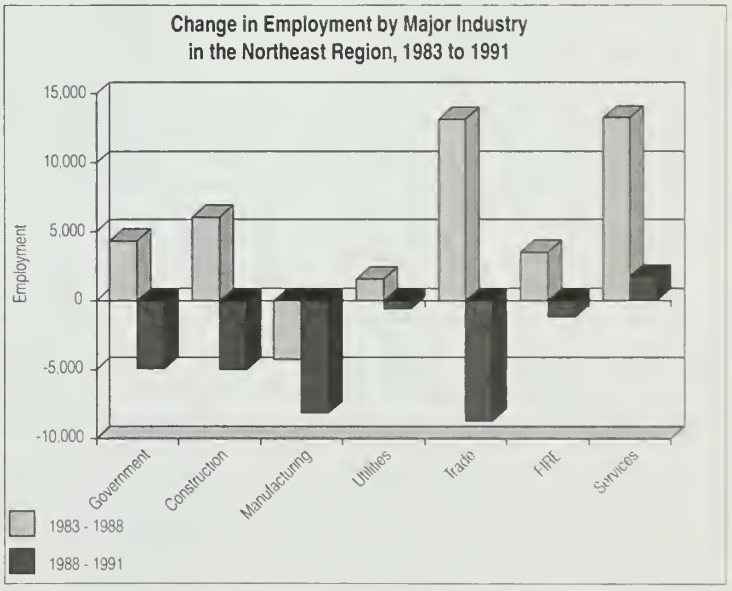


Figure 12A

missiles is of a similarly disproportionate importance to the Lower Merrimack Valley.

While strong growth in the above mentioned sectors brought great dynamism to the region in the early- and mid-1980s, the heavy reliance upon these industries has also made the region very vulnerable. The Northeast lacks the manufacturing diversity which would allow strength in other industries to offset troubles in these core business areas. The other manufacturing industries in the region are predominantly tied to the fortunes of the computer, military transportation equipment, and communications industries. Although there is some independent demand for their products, the region's search and navigational instrument, electronic component, and semiconductor industries are highly dependent upon the computer and guided missile industries. The readjustment in the computer industry and post-Cold War defense cuts during the late 1980s caused serious structural difficulties in the region's core industries. As a result, the whole manufacturing sector has suffered with them. One of the few bright spots within Northeast manufacturing has been the textile industry, which has weathered the recession remarkably well. Employment in this industry fell only 0.6 percent between the fourth quarter of 1988 and the fourth quarter of 1991.

With respect to services, the Northeast has a somewhat lower than average concentration of high wage business, engineering and management services. These types of services tend to be provided by firms in the nearby Boston area. In the Lower Merrimack Valley area, lower-paid services such as health, education and repair comprise fully 67 percent of total service employment, contrasted with a statewide average of only 59.7 percent. This disparity is reflected in average service wages. Average Northeast service sector wages in 1991 were $23,816, compared to $27,913 statewide.

Retail, on the other hand, constitutes a smaller percentage of the Northeast economy than elsewhere in the state. Only 16.1 percent of the region's employment lies in this area, as opposed to 18.4 percent statewide. Apart from a marginally higher than average concentration of food suppliers, the composition of Northeastern retail is generally the same as the statewide mix. Construction, finance, and real estate each constitute less than 5 percent of employment in the region.

The Northeast Region's performance during the current recession has been worse than the state and national averages. As a manufacturing-dependent region with a heavy concentration in the computer and defense-related industries, the Northeast has been disproportionally hard hit by the recession and is likely to take longer to recover than many other regions in the state and nation.

Population Characteristics

Population in the Northeast grew rapidly during the 1980s. In 1990, the region was home to 541,841 residents. This marked an 11 percent increase over 1980, when regional population had stood at 487,884 — more than twice the statewide population growth of 4.9 percent over the same period of time. The primary cause of the high rate of population growth was natural increase, but attractive housing markets and a strong regional economy also drew over 5,000 people to the region.

As illustrated in Figure 12B, the residents of the Northeast are 89.8 percent white, 8.6 percent Hispanic, 3 percent Asian and 1.8 percent black. Although relatively small on a regional basis, the Northeast's minority representation is concentrated in the cities of Lowell and Lawrence where they constitute a significant share of the local population. Figure 12C shows how per capita income varies by race in the region.

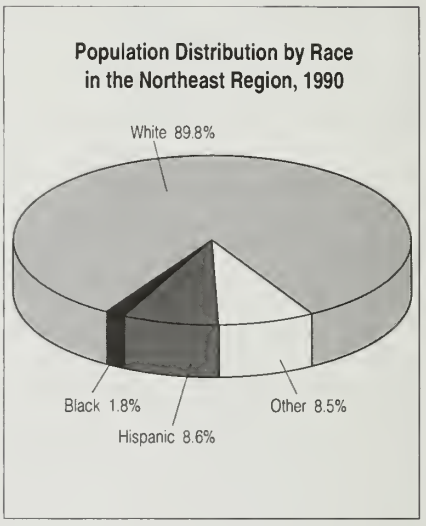


Figure 12B

The region's educational attainment levels lie somewhat below the state averages. In 1991, 77.3 percent of Northeast residents had a high school degree and 23.8 percent had a bachelor's degree or higher, compared to the statewide figures of 80 percent and 27 percent. Educational attainment did improve between 1980 and 1990, however, as shown in Figure 12D.

Throughout the 1980s, the Northeast's labor force expanded at a rate which exceeded population growth by a significant margin. Strong performance in the defense and computer industries combined with a maturing population and higher rates of female workforce participation to cause the labor force to grow by over 15 percent, from 239,750 in 1980 to 282,490 in 1989. Growth was espe-

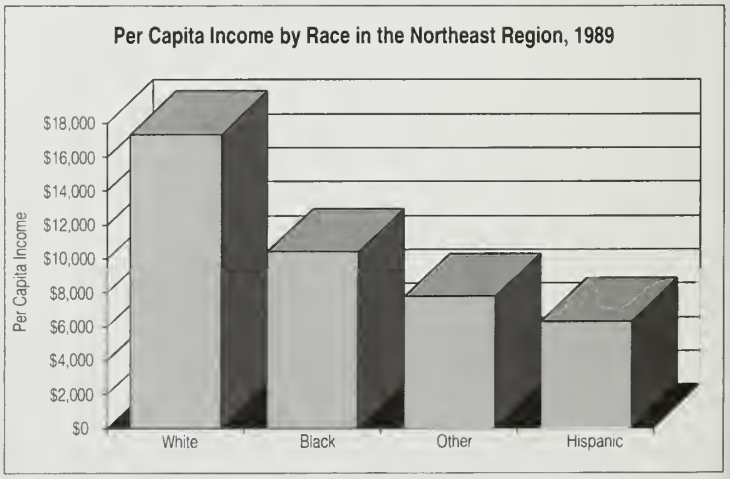


Figure 12C

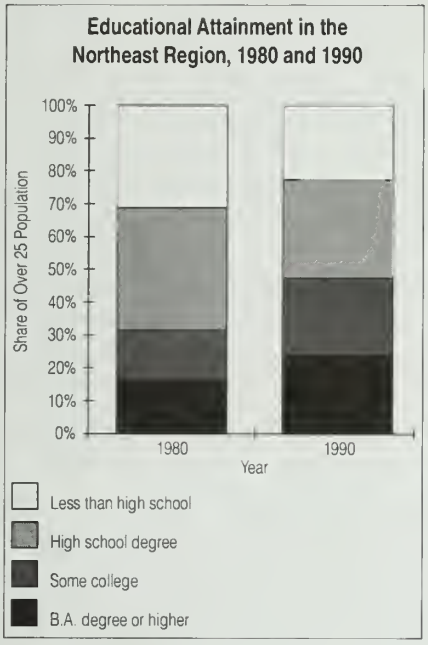


Figure 12D

cially strong in Northern Middlesex County where the labor force increased by over 25 percent during the 1980s. Job creation exceeded labor force growth, causing unemployment to fall from 6.6 percent to 3.8 percent between 1983 and 1987. As illustrated by Figure 12E, employment performance across the region was strongest in the beginning of the decade and trailed off toward the end. The onset of recession in 1989 and serious structural problems in both the computer and defense-related industries caused unemployment rates to rise steeply and the size of the labor force to contract. By 1991, unemployment had reached an annual average rate of 10 percent. Since the peak years of the mid-1980s, unemployment has consistently been running higher than national and state averages. In September of 1992, for example, the unemployment rate in the region was 10.1 percent, while the corresponding state and national figures were 8.4 percent and 7.2 percent. In the Northeast's main urban areas of Lawrence and Lowell, unemployment for the first 11 months of 1992 stood at 13.4 percent and 11.5 percent, respectively.

In 1989, the average annual wage in the Northeast region was $25,152. On a region-wide basis, the wage structure of the Northeast is quite similar to the state average ($25,220 in 1989). There is, however, considerable wage variation within the region. In 1989, average wages in the Lower Merrimack Valley were only $24,017, or almost 5 percent below the statewide average. In contrast, Northern Middlesex County had an average wage of $26,241, which was 4 percent higher than the statewide figure.

This wage structure disparity is explained by the atypical composition of the region's manufacturing industries. Although both areas have high concentrations of manufacturing, the types of manufacturing carried out in Northern Middlesex are focused heavily upon the high-wage computer industry. The Lower Merrimack Valley has a far greater proportion of moderately paid transportation and electronics jobs. Due to the large number of jobs lost in Northern Middlesex's high-wage computer industry, regional wage disparities have diminished somewhat over the past few years. Per capita income levels in the region are shown by Figure 12F.

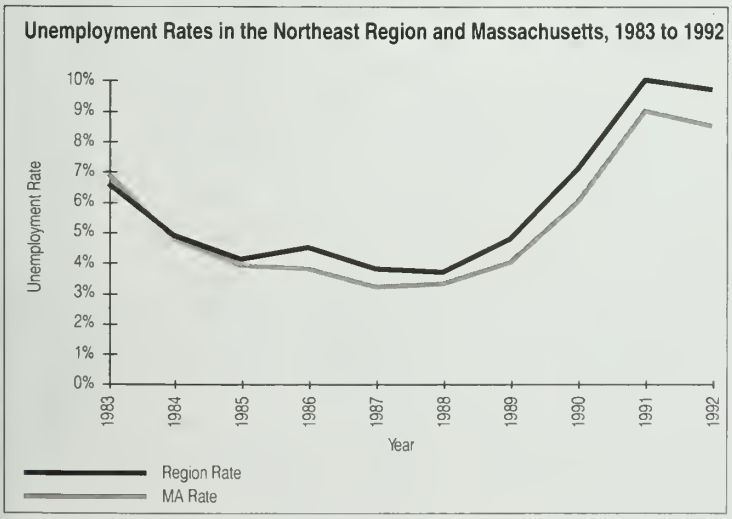


Figure 12E

INDUSTRY AND EMPLOYMENT TRENDS

Industry Profiles

The employment figures for the Northeast industries discussed below are summarized in Figure 12G.

Computers and Electronics

The computer industry and its related enterprises constitute a significant proportion of the Northeast Region's industrial and employment base. Giants such as Digital Equipment Corporation, Bull Information Systems, and Wang Laboratories have been major employers in the region. A crop of medium-sized contractors such as Davox Corporation in Billerica, Memotec Datacom in North Andover, and Electronic Pre-Press Systems in Billerica have been vital to the regional economy as well. Demand for peripheral equipment to accompany the computer products produced in the region has led to the development of a number of disk drive and memory expansion board manufacturers such as Concurrent Computer Corporation in Westford, IDE Associates in Billerica, and Sipex Corporation in Billerica. Northeastern manufacturers of electronic components such as printed circuit boards and semiconductors also constitute an important industrial segment. Alternative Circuit Technology in Haverhill and the Powercube Corporation in Billerica are two of the important local firms engaged in this area. Together, this cluster of interrelated firms employed approximately 19,570 people in 1991 — easily the largest industrial grouping in the region.

The minicomputer boom of the early 1980s fueled 24 percent growth in the computer industry between 1980 and 1984. Since 1985, however, the industry has been transformed and competition has grown far more intense. Advances in microprocessor technology and the emergence of highly efficient specialty producers have increasingly made hardware into a low-margin product. Large shares of the minicomputer market have meanwhile been stolen by PCs and workstations. The recent emergence of products

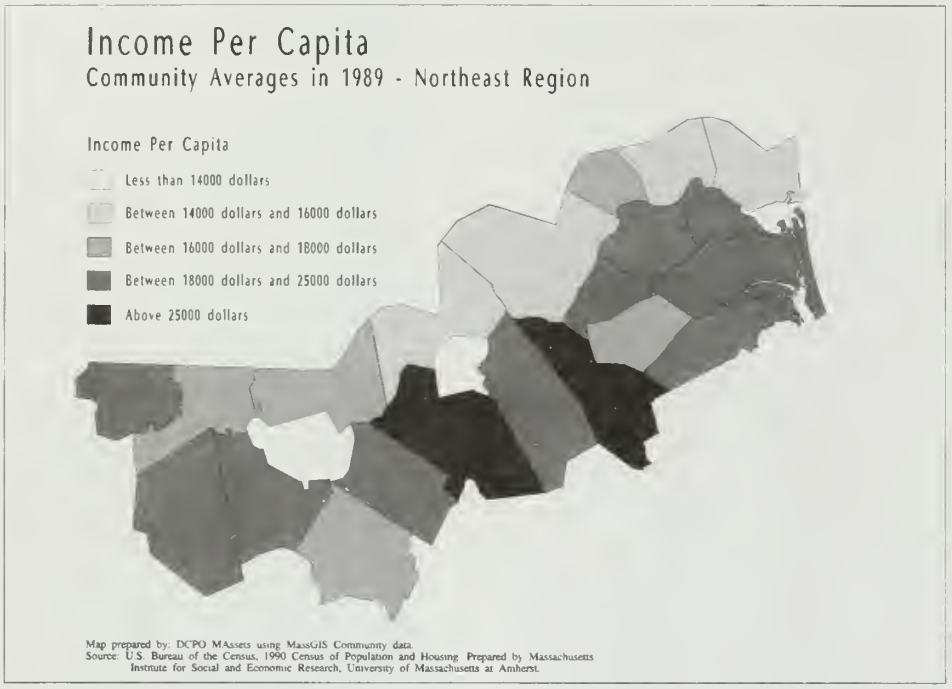

Income Per Capita
Community Averages in 1989 - Northeast Region
Income Per Capita
Less than 14000 dollars
Between 14000 dollars and 16000 dollars
Between 16000 dollars and 18000 dollars
Between 18000 dollars and 25000 dollars
Above 25000 dollars
Map prepared by: DCPO MAssets using MassGIS Community data.
Source: U.S. Bureau of the Census, 1990 Census of Population and Housing. Prepared by Massachusetts Institute for Social and Economic Research, University of Massachusetts at Amherst.

Figure 12F

such as laptops, pen-based PCs and digital assistant computers have sent new shock waves through the entire industry. Since 1989, these changes have led to consolidation and numerous industry mergers producing widespread unemployment. Particularly hard hit have been the large vertically integrated computer producers.

Local producers such as Digital, Bull, and Wang have been forced to downsize and reorganize their operations in response to the changed marketplace and dramatically enhanced competition. Wang Laboratories, once the employer of over 10 percent of Northern Middlesex County's private sector workers, has been devastated. A protracted and painful decline culminated in August 1992 when Wang filled for Chapter 11 bankruptcy protection. Wang also laid off an additional 5,000 employees, mostly in the Northeast region. Although the collapse of Wang is certainly the overriding development in this cluster, Bull and Digital have also been forced to make significant cuts in their local workforces. The fact that regional employment in the Northeast's computer industry fell by more than 35 percent from the fourth quarter of 1988 through the fourth quarter of 1991 is a testimony to the extent of these problems and the calamitous impact they are having upon the region. Fully three-fifths of 1991 losses in regional manufacturing employment can be traced to the computer industry.

The collateral damage caused by the problems in the computer industry is clearly visible among the Northeast's electronic components and accessory firms, many of which supply to the computer industry. Between 1988 and 1991, component and accessories employment fell by 14.7 percent, from 4,961 to 4,230, exceeding the national industry decline during the same period. Although the recession caused a cyclical decrease in demand for these types of products, problems in the computer industry explains the particularly poor performance of local firms.

The computer industry and its related electrical component manufacturers will eventually recover. Society is becoming increasingly computerized and demand in this area is projected to grow steadily. The future viability of large vertically-integrated computer manufacturers such as Digital and Bull is less certain, however. Many industry analysts predict that these giants must continue to undergo drastic decentralization to remain competitive with smaller and more efficient players. Digital has recently announced a massive reorganization which will involve laying off 20,000 employees, some of whom will be from the Northeast. Economic dynamism and job creation in the region's computer industry is, therefore, most likely to come from innovative small- to medium-sized firms which are able to find market niches. One of the most promising areas for growth in the industry is the ability to tie together networks of computers and other electronic components. The Northeast's distinctive cluster of hardware, software and telecommunications firms are already combining expertise to take a lead in the field.

Telecommunications

The Northeast Region has a large concentration of employment in the manufacture and servicing of telecommunications systems. In 1991, over 9,900 people were employed by firms in this cluster. AT&T, with its workforce of approximately 6,500 in North Andover, is one of the region's largest employers. These workers manufacture computer networking hardware, satellite communications equipment, network switches, voice messaging and video conferencing equipment. In addition to AT&T's huge operations, there are a number of small- and medium-sized companies in the region which also produce sophisticated communications systems and equipment. Loral Microwave FSI in Chelmsford, for example, makes microwave signal sources and control devices with approximately 500 employees. CPS Inc. in Billerica produces signal processing computers with a 120-person workforce. Davox Corporation produces computer aided communications equipment in Billerica with a workforce of roughly 250. There are many other firms in the cluster, all of whom contribute a large number of high skill, high value-added, high wage jobs to the region.

In addition to its high concentration of telecommunications manufacturing, the Northeast has a host of related industries which make important contributions to the regional economy. Northeast employment in telephone communications infrastructure and support was 1,830 in 1991 — a figure down from a level of roughly 2,200 in 1988.

NORTHEAST REGION
EMPLOYMENT BY MAJOR INDUSTRY
1988 Fourth Quarter - 1991 Fourth Quarter

INDUSTRY	EMPLOYMENT CHANGE 1988-1991 FOURTH QUARTER 1988	1991	NET CHANGE	PERCENT CHANGE	PERCENT OF 1991 TOTAL EMPLOYMENT
TOTAL EMPLOYMENT	233,510	201,720	(31,790)	-13.6%	100.0%
TOTAL PRIVATE EMPLOYMENT	204,410	175,260	(29,150)	-14.3%	86.9%
AGRICULTURE, FORESTRY, & FISHING	1,000	920	(80)	-8.0%	0.5%
MINING	200	150	(50)	-25.0%	0.1%
CONSTRUCTION	10,390	5,790	(4,600)	-44.3%	2.9%
Special Trade Contractors	6,940	3,770	(3,170)	-45.7%	1.9%
MANUFACTURING	77,240	64,010	(13,230)	-17.1%	31.7%
Textile Mill Products	3,350	3,330	(20)	-0.6%	1.7%
Printing & Publishing	2,970	2,800	(170)	-5.7%	1.4%
Industrial Machinery & Equipment	22,490	14,440	(8,050)	-35.8%	7.2%
Electronic & Other Electric Equipment	13,680	12,140	(1,540)	-11.3%	6.0%
Transportation Equipment	10,230	8,970	(1,260)	-12.3%	4.4%
Instruments & Related Products	6,370	6,440	70	1.1%	3.2%
TRANSPORTATION & PUBLIC UTILITIES	10,520	8,870	(1,650)	-15.7%	4.4%
Trucking & Warehousing	3,240	3,100	(140)	-4.3%	1.5%
WHOLESALE TRADE	9,800	9,050	(750)	-7.7%	4.5%
Wholesale Trade - Durable Goods	6,340	5,770	(570)	-9.0%	2.9%
Wholesale Trade - Nondurable Goods	3,460	3,280	(180)	-5.2%	1.6%
RETAIL TRADE	38,150	32,530	(5,620)	-14.7%	16.1%
Food Stores	8,890	8,150	(740)	-8.3%	4.0%
Eating & Drinking Places	11,730	11,220	(510)	-4.3%	5.6%
Miscellaneous Retail	4,850	4,500	(350)	-7.2%	2.2%
FINANCE, INSURANCE & REAL ESTATE	8,770	7,100	(1,670)	-19.0%	3.5%
Depository Institutions	4,550	3,260	(1,290)	-28.4%	1.6%
SERVICES	48,340	46,860	(1,480)	-3.1%	23.2%
Business Services	9,460	7,920	(1,540)	-16.3%	3.9%
Health Services (private)	17,320	18,640	1,320	7.6%	9.2%
Social Services	3,930	3,880	(50)	-1.3%	1.9%
Engineering & Management Services	3,550	3,900	350	9.9%	1.9%
GOVERNMENT	29,230	26,450	(2,780)	-9.5%	13.1%
FEDERAL	4,910	4,420	(490)	-10.0%	2.2%
STATE	3,060	2,870	(190)	-6.2%	1.4%
LOCAL	21,260	19,170	(2,090)	-9.8%	9.5%
Educational Services	13,740	12,050	(1,690)	-12.3%	6.0%

SOURCE:Massachusetts Department of Employment and Training, Employment and Wages/ES-202.
NOTES:Northeastern Massachusetts Region consists of the Northern Middlesex and Lower Merrimack Valley Service Delivery Areas. Data represent jobs covered by Unemployment Insurance laws. Data are not adjusted for non-economic changes in industry or geographic coding that may have occurred between the comparative periods.
C= CONFIDENTIAL DATA N.E.C.= NOT ELSEWHERE CLASSIFIED

Figure 12G

In 1989, there was a loss of roughly 300 jobs due to a labor dispute. After that dispute was resolved, employment figures recovered to pre-strike levels. As a result of the increasing importance of telecommunications to all forms of business and the technological complexity of the systems involved, a number of telecommunication service and consulting firms have developed in the Northeast Region.

The convergence of computers and telecommunications has transformed the way in which information is exchanged and has opened up dynamic growth potential. Over the past five years, innovative new product areas such as network systems, fiber optics technology, video teleconferencing and cellular telephony have been an important source of growth and employment for the state and the Northeast Region. The scope of the Northeast's communications cluster is not limited to the manufacture and servicing of commercial telecommunications equipment. In 1990, the production of communications equipment was the single largest area of government defense contracting in the state, accounting for over $930 million of defense contract income. Traditionally, the northeast has received a comparatively large share of these communications contracts. However, since the end of the Cold War, the number and size of defense communication contracts has been cut back significantly. Although large compared to many other areas of defense spending, 1991 communications equipment procurement income shows a precipitous decline of 56 percent from 1989 levels. This explains in part the 18.7 percent decline in communications employment between 1988 and 1991.

Transportation Equipment and Guidance Instrumentation

In 1991, the Northeast transportation equipment and guidance instrumentation cluster employed approximately 14,500 people. The majority of this employment can be traced to the production of guided missiles and space vehicles at Raytheon Corporation's Andover, Lowell, and Tewksbury establishments. In 1990, Raytheon received $3.03 billion in prime contract awards — making it the largest contractor in the state. Two Northeast Region sites — Andover and Lowell — were also among the ten top locations for defense expenditures in the state that year. The production of missiles and space vehicles has traditionally been a lucrative source of revenue and jobs for the region. Developments over the past three years have, however, transformed the defense sector and have forced a comprehensive readjustment for both Raytheon and the region's economy.

Far-reaching defense cuts resulting from the end of the Cold War have brought about extensive downsizing. Statewide employment in the production of guided missiles, space vehicles and parts declined 7.8 percent from 17,583 in 1988 to 16,210 in 1990. By all estimates, defense spending will contract further in the years to come and government contracts for guided missiles and space vehicles will not be spared. The structural problems facing the guided missile industry have been visible in Raytheon's recent performance. As of late 1992, Raytheon employs 11,600 people in the region (5,000 in Andover, 2,700 in Lowell and 3,900 in Tewksbury). This marks an 11.5 percent decline from the previous year's average when Raytheon employed 13,100 people. Raytheon management anticipates further layoffs during the next year. While acknowledging the great impact that federal defense cuts will have on its business, Raytheon is positioning itself to meet growing domestic and foreign demand for defensive missile system. Raytheon recently won contracts to make improvements to its Patriot system, 65 percent of the contract for the SM-2 Standard Missile and 55 percent of an award to produce 900 AMRAAM missiles. Export sales, such as recent orders for the company's Patriot Missile systems from Saudi Arabia and Kuwait, will help to stabilize the company's defense business. The company also has plans to emphasize its commercial diversification program in the coming years. While none of Raytheon's non-defense divisions are located in the Northeast, the rapidly growing Badger engineering division in Cambridge is within commuting distance of the region.

The Northeast is home to a number of subcontractors that produce search, detection and guidance instruments for the guided missile and aerospace industry. Whistler Corporation, for example, makes radar receivers with a workforce of roughly 550 in Westford. M K S Instruments in Andover produces control instruments with a workforce of 550. Inframetrics Inc. makes infrared and thermal imaging systems in Billerica with approximately 170 employees. Just across the regional line in the towns of Wilimington and Bedford, Ametek Aerospace, Textron Defense Systems and Raytheon produce air defense and tactical missile control systems with a combined workforce of approximately 10,000.

The missile and space vehicle instrumentation industry is very closely related to the guided missile production taking place in the Northeast Region — not only as a primary source of demand, but as a resource for acquiring industry information. During the growth years of the 1980s, this interrelationship was highly beneficial. In the period since 1989, however, these firms have been forced to make large production and employment cutbacks because of this dependence. Statewide employment in the production of search and navigational equipment declined 2 percent between 1989 and 1990, from 17,131 to 16,790.

The problems facing the guided missile, space vehicle, and instrumentation industries are structural rather than cyclical and are therefore unlikely to be remedied by an upswing in the economy. While contracts to upgrade existing missile systems, and the opening of foreign markets may eventually halt the pattern of layoffs, the prospects of regaining significant portions of the employment lost since 1989 are not good. The implication of this is that there are likely to be a large number of highly skilled unemployed workers who will not be easily absorbed by the regional economy, even after the recession is over.

Northeast Regional Profile

Other Important Industries

In addition to these major clusters, the Northeast has a number of smaller successful industries. Textile and apparel firms, for example, employed an annual average of 4,430 people in 1991. Joan Fabrics Corporation in Lowell, Malden Mills Industries in Lawrence, and Grieco Brothers have successfully weathered the problems which have afflicted the American textile industry over the past 20 years. While a record number of plants are closing in other parts of the country, these and other firms in the region have managed to find successful niche markets and implement efficient manufacturing processes that have allowed them to maintain stable employment over the past few years. Many Northeast plants have worked to ensure their continued competitiveness through sizable investments in new machinery and training programs aimed to improve productivity and quality.

COMPETITIVE ADVANTAGES OF THE NORTHEAST

Location and Infrastructure

With its regional centers of Lowell and Lawrence located only 25 miles from Boston, the Northeast has the advantage of being close to one of the country's largest urban areas with its extensive array of markets, suppliers, research facilities, financial resources, consulting services, and government offices. The Northeast is also able to benefit from the intense economic activity in the Greater Boston area. Given its concentration of high-tech manufacturing, Boston's stature as one of the world's primary high technology centers is an immeasurable advantage — not only in developing know-how, sophisticated market information and gaining access to emerging technology, but as a means of attracting business.

The Northeast Region is served by excellent road, rail, and air transportation networks. This helps keep transportation costs down and response efficiency competitive. Route 93 and Route 95 provide the region with direct north-south interstate transportation. Route 495 meanwhile provides excellent east-west transportation and high volume access between Lowell and Lawrence, the region's primary economic and population centers. The location of several of New England's major freight terminals in the Northeast also serves as an advantage, cutting down on transportation costs and delay. The Northeast Region's proximity to the Boston area meanwhile gives it superior national and international air transport access through Logan Airport. The Boston and Maine Railroad cuts straight through the Northeast and provides it with superb rail freight access. The creation of a new intermodal rail transportation facility at Fort Devens will give the region access to the Canadian Pacific Railroad and transcontinental service.

Investment

Its close proximity to Boston and large number of established firms leaves the Northeast in a favorable credit and capital position relative to other Massachusetts regions. Major Boston and New England banks reportedly are actively involved in lending in the Northeast to a greater degree than in other areas outside of Boston. The Northeast also benefits from a well developed local banking system which makes commercial capital available to local businesses.

Educational Resources

The Northeast is well positioned with respect to business-university cooperation. The Center for Industrial Competitiveness at the University of Massachusetts at Lowell seeks to develop an understanding of, and provide solutions to regional economic problems through a public-private-academic partnership. Through the development of a database and seminar series, the Center seeks to be a source of information about trends and conditions affecting competitiveness. In addition to local resources, the Northeast Region benefits from its close proximity to the major research and educational institutions located in Boston.

Workforce Skills and Availability

A large pool of unemployed machinists and other highly skilled workers has been created by the contraction of the computer and military transportation industries (See Figure 12H). In addition to Northeast Massachusetts residents, there is a large and easily accessible surplus labor supply in southern New Hampshire. New and expanding businesses located in the Northeast therefore enjoy the advantage of having a large number of qualified workers to choose from. The Northeast Region also has an extensive array of training and retraining programs in most major industrial areas. Local programs meet the needs of industry and business through a system of vocational and technical high schools, community colleges and other providers. Training certificates in biotechnology, advanced materials, and management are

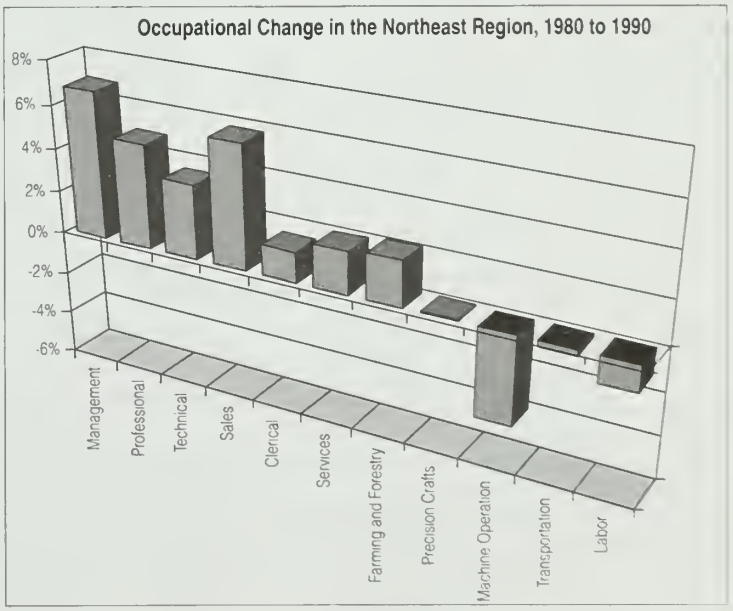


Figure 12H

available, as are programs in a host of computer programs and technical processes. The demands of emerging and future industries are also being addressed aggressively to insure that the region continues to maintain high skill levels. In 1992, the Lower Merrimack Valley Regional Employment Board was, in fact, the only Regional Employment Board to be recognized by MassJobs Council for exceeding all its 1992 goals. Together, these efforts make the Northeast attractive to business in that they ensure a means of workforce training and high productivity achievement.

Existing Industry Clusters

The Northeast Region's large computers and communications clusters are high tech industrial areas which provide high wages and have potential for considerable growth in the future. Although both are making structural adjustments, their long-term outlook is very positive and they are exactly the kinds of industry which are likely to create dynamic economic growth in the future. The Northeast's strong defense sector also has a great deal to offer the region in terms of new advanced manufacturing technology and processes.

CHALLENGES TO FUTURE GROWTH

Investment

Like many regions in the Commonwealth, the poor availability of investment capital and credit is cited in the Northeast as a significant impediment to growth. Despite greater access to local capital, the closing and takeover of a number of financial institutions throughout the Commonwealth and the dramatic fall in real estate values makes it more difficult than ever to gain access to credit and investment. Smaller businesses with few hard assets and unproven track records are being particularly hard hit.

Although the Northeast does not have a particularly high concentration of small businesses, it is undergoing a structural readjustment which is imposing a host of difficulties upon the region. The problems experienced by the large computer and guided missile companies have left their smaller suppliers and subcontractors in trouble as well. In order to adjust, these companies will have to diversify and find new markets. However, the inaccessibility of capital constitutes a significant impediment to the successful implementation of this transition. The growth of the software industry is seen as particularly crucial to securing the future of the computer industry in the Northeast, but the region's fledgling software companies are experiencing acute problems in gaining access to funding.

The Northeast Region's large computers and communications clusters are high tech industrial areas which provide high wages and have potential for considerable growth in the future. Although both are making structural adjustments, their long-term outlook is very positive and they are exactly the kinds of industry which are likely to create dynamic economic growth in the future. The Northeast's strong defense sector also has a great deal to offer the region in terms of new advanced manufacturing technology and processes.

Educational Resources

The below average educational attainment figures for the Northeast denote a pressing need for better primary and secondary education in the region. Problems such as overcrowding and insufficient funding are especially severe in the inner city areas of Lawrence and Lowell. The large immigrant populations in these city areas put further strains on the educational system to provide resources to teach English as a second language. The schools are unable to sustain the demands being placed on them, and the region's young people are suffering as a result.

Workforce Skills and Availability

There is the danger in the Northeast Region that laid-off, highly skilled workers will begin to move to other areas because the current concentration of employment in relatively few companies makes it difficult to find new employment in the region. Such an outmigration of experience and talent could ultimately have serious negative repercussions for the long-term economic growth of the region.

Distressed Areas

Although the Northeast Region as a whole is relatively prosperous, it is also home to a few pockets of serious economic distress. The City of Lawrence, in particular, suffers from a number of socio-economic problems. Once a thriving center of industry, Lawrence has seen its economic vitality ebb away over the past century. The recent recession has exacted a heavy toll on the city's traditional manufacturing base and has caused extensive dislocation. With fully 27.5 percent of its population living below the official poverty line as of 1989, Lawrence has the highest proportion of poor people of any community in the Commonwealth. Lawrence also has below average educational attainment levels and unemployment has averaged over 13 percent in 1992. The City of Lowell has also fared very poorly through this recession, with its main employer, Wang, going bankrupt and unemployment averaging over 11 percent.

REGIONAL POLICY PRIORITIES

Investment

Due to the Northeast's paucity of initial capital for software companies and other new firms, it will be necessary to undertake special efforts to facilitate loans for new business, and the financing of knowledge assets

(research, development and training) in particular. Although it is in large part the smaller companies which have difficulty gaining the credit and capital they need, steps should also be taken to insure that the larger employers in the region make the investments in plant and equipment necessary to remain competitive over the long term.

Several of the programs described in this *Strategy* address these issues:

- An increased investment tax credit can help companies to make the investments in plant and equipment they need to remain competitive.
- A long-term capital gains tax reduction would help to stimulate long-term patient investment in Northeast industry, particularly in new and small firms.
- An Early Stage Equity Capital Program designed to assist start-up companies would be especially useful in generating the initial financing for knowledge-based enterprises such as the Northeast's emerging software industry.
- A Small Business Capital Access Program can help Northeast firms to make the working capital investments they need to grow and prosper.

Education

The enhancement of communication and cooperation between schools and business is a primary development priority in the Northeast. Incentives need to be set up which will encourage industry-based education, internships and collaborative field programs. This approach will not only improve the quality of basic education, but help to endow students with the knowledge and skills which will be of greatest use to industry when they enter the workforce. The Commonwealth also needs to establish incentives to foster coordination among the region's community colleges and vocational schools to improve the efficiency of education and preparation. The large Asian and Hispanic populations in Lowell and Lawrence make special educational efforts directed at non English-speaking students especially important.

Several of the programs described in this *Strategy* address these issues:

- An expansion of early childhood programs for at risk children would be very important in the inner city areas of Lawrence and Lowell.
- The Commonwealth should strive to improve the quality of basic education by implementing a core curriculum and setting more stringent achievement standards.
- The Commonwealth also needs to establish incentives to foster coordination among the region's community colleges and vocational schools to improve the efficiency of education and preparation.
- The Commonwealth should encourage programs to link higher education with businesses, such as the University of Massachusetts at Lowell's Center for Manufacturing and Center for Industrial Competitiveness.

Training

The Northeast economy is undergoing a period of great structural readjustment in many of its core industries. These structural problems make training and retraining particularly important, because a large proportion of laid-off workers are unlikely to be rehired by their former employers in the foreseeable future. The downsizing which has taken place in the computer and defense-related fields reflect underlying systemic changes and are not likely to be quickly reversed after an upswing in the economy. It is therefore crucial to retrain displaced workers so that they can be reabsorbed into other sectors of the economy as soon as possible. In addition to addressing the immediate challenges imposed by structural readjustment, a main priority is insuring that the specific needs of industry are anticipated and met by training efforts.

Several of the programs described in this *Strategy* address these issues;

- The MassJobs Council is pursuing the creation of a workforce development system that will meet the needs of Northeast Region companies, rather than be driven by federal programs or the current capabilities of service providers.
- The Commonwealth can create special representatives to work closely with key industries to insure that worker training keeps pace with technological change and the needs of business.
- The short-term nature of federal funding for training programs is a major barrier to long-term planing, and state efforts must therefore be made to allow for more flexible funding of training programs.
- The coordination of the region's training and retraining resources would dramatically improve their effectiveness.

Know-How and Industrial Modernization

The structural changes currently taking place in the northeast make it especially important for local firms to keep abreast of new manufacturing techniques and processes. Firms will be far better able to address the challenges in their paths if they remain up-to-date. By winning the prestigious Baldridge award, AT&T has proven that local manufactures can produce world-class products in the Northeast if they make an effort to be innovative. Smaller firms can learn about and adopt the "best practices" of AT&T and other companies through industrial extension services:

- Northeast firms, particularly smaller firms, would be helped by a state-run Industrial Extension Service designed to identify and disseminate information about "best practices" in technology, production methods, and training.
- Know-how and industrial modernization will be encouraged through an effort to improve business ties to the University of Massachusetts at Lowell and other state universities and colleges.

Northeast Regional Profile

Infrastructure

Although the Northeast's road infrastructure is generally strong, a few capital projects have been targeted for the region. The emphasis should be upon concentrating infrastructure capital in the areas where it can have the greatest benefit. A comprehensive strategy should be drawn up and a process established for coordinating the efforts of local, regional and state bodies.

The state is exploring the following projects:

- Widening the arterial spokes for I-93 to four lanes, constructing four-way interchanges along Route 495, 93 and 128, and widening Route 3 are projects which could greatly facilitate commercial and commuter road traffic in the Northeast.
- The Massachusetts Bay Transportation Authority is designing an extension of the Ipswich commuter rail line to Newburyport which, if completed, should greatly improve transportation to and from Boston for Northeast residents.

Regulatory Environment

The Northeast Region is inordinately sensitive to factors affecting business climate. Because of their proximity to and direct competition with firms located in southern New Hampshire, many Northeast businesses find the Commonwealth's regulations and blue laws to be too stringent. In particular, local business leaders stress the need to establish a level playing field with regard to health care, unemployment insurance and worker compensation. The State Superfund law, Chapter 21E, is assailed for inhibiting development in urban areas because it can discourage the reuse of existing mill structures. It is felt that the local costs of doing business are raised unnecessarily due to regional variations and unnecessary procedures.

Several of the programs described in this *Strategy* address these issues:

- Standardization of statewide regulations, creation of one-stop shopping and the provision to improve business input would have important positive development effects.
- Establishing regional information and permitting centers modeled on the DEP Western Regional Office in the Northeast would simplify and speed up the regulatory process.
- The recently adopted changes to Chapter 21E liability regulations will contribute to a more favorable business climate by eliminating many of the disincentives associated with developing existing industrial structures.

The Northeast Region is a leader in advanced telecommunications, with major manufacturers such as AT&T's Merrimack Valley Works. The region's communications, computers, and defense industries are combining their expertise to enter new markets such as data internetworking.

Photo Courtesy of AT&T.

New and Small Business

New and small business growth has become significantly more important to the Northeastern economy after the recent contraction of some of the region's largest employers. New businesses will be key to the future growth of employment in the region.

The development of small software firms is seen as particularly important to the future survival of the computer industry in the Northeast. The large-scale downsizing at Wang and Raytheon has left a number of highly skilled engineers and other professionals unemployed who would be ideal start-up entrepreneurs in software and other areas of business. Many of these individuals might well prefer to start up their own enterprises than move to another region of the state or country.

Unfortunately, launching a new company is an imposing task and software companies are particularly susceptible to the many pitfalls of new business creation. In order to stimulate the creation and growth of new businesses, therefore, steps must be taken to provide advice and assistance to entrepreneurs.

Several of the programs described in this *Strategy* address these issues:

- An Early-Stage Equity Program should be designed with a special focus on new businesses that would otherwise be unable to collect the capital they need to get started.
- A long-term capital gains tax reduction would encourage the formation of the long-term "patient" capital which start-up firms need to succeed.
- By setting up regulatory procedures which would simplify standard and permit requirements for new and small businesses, the Commonwealth can remove many of the administrative burdens which inhibit new and small business growth.
- The Commonwealth's training and industrial extension initiatives would help create groups of small businesses which can identify common needs and pool their resources in the pursuit of common objectives.

Northeast Regional Profile

Exports

Given the Northeast's concentration of high-tech firms, export promotion is especially important to long-term regional growth. Foreign markets must be aggressively pursued to generate additional demand and develop new opportunities. Some of the Northeast computer and communication industries' fiercest competitors are firms headquartered in Europe or Japan. In order to be competitive, Northeast high-tech firms must pursue a global strategy to compete beyond national boundaries. Good performance in European and Asian markets is essential to their growth. A similar trend taking place in the defense-related field can be detected in Raytheon's recent announcement of its intention to increase sales abroad as a integral part of its overall growth strategy. Export promotion can be particularly important for smaller computer, communication, and defense subcontractors in the region who have seen much of their local demand dry up recently. Export deals can be very complicated, however, requiring prohibitive levels of resources and expertise. In order to expand their markets abroad, many Northeast firms will need technical advice and marketing assistance.

Several of the programs described in this *Strategy* address these issues:

- Northeast firms can receive technical and marketing assistance on export issues through the Massachusetts Office of International Trade and Investment and the Small Business Development Center .
- A proposed Export Finance Program could be employed by Northeast firms that are interested in exploring export opportunities, but have had difficulty obtaining the loans necessary to fill foreign orders.

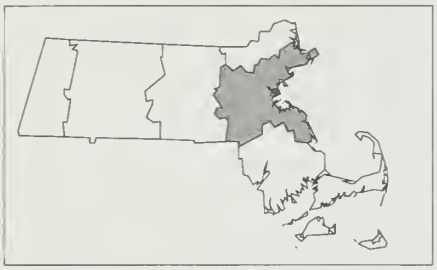
Economically Distressed Areas

The Northeast Region suffers from some urban problems, particularly in the City of Lawrence. High unemployment, poor education and crime are persistent problems for these areas. Resolving these problems should play a part in an overall development strategy for the region.

Several of the programs discussed in this *Strategy* address these issues:

- Economic Opportunity Areas could be set up in distressed areas to create jobs with the help of tax incentives, infrastructure investment and permit assistance.
- Microenterprise loans are specifically targeted at promoting business development in distressed urban and small city areas.
- The Executive Office of Communities and Development oversees a number of development grants which can be used to help economic development efforts in cities such as Lawrence and Lowell.

Chapter 13 Greater Boston Regional Profile



CHARACTERISTICS OF THE REGION

Geographic Description

Greater Boston is the largest, most diverse region of Massachusetts, accounting for nearly half the state's population and more than two thirds of its employment. Stretching along the Atlantic shore from Duxbury in the south to Rockport in the north, the region made its first fortunes from the sea, and still contains major shipping and fishing ports. The region's most prominent inland features are probably the two roads ringing the city of Boston which roughly define its borders and serve many of its employment centers: Route 128/95 running about 10 miles outside of Boston, and Route 495 running about 35 miles from the city. The region is almost wholly urban and suburban, but many of its cities and towns have kept their historic character.

Economic Structure

Greater Boston is the heart of the nation's seventh largest metropolitan area, an economic and political center whose unusual combination of strengths in education, research, finance, and specialized services enable it to be an international leader in advanced, high-value added goods and services. The success of this economy in the 1970s and 1980s was predicated on its ability to create new products and services that commanded high prices and high market share because of their unique nature, superior performance, and/or high quality—whether in minicomputers, missile systems, or mutual funds. The high cost structure of the region requires that it continue to compete on the basis of innovative, unique products and services that can command a premium price in world markets.

The region's base economy is concentrated into several industry clusters of interrelated companies and institutions which interact in a manner that fosters innovation and competitive strength. These clusters include:

- *Knowledge creation services.* Greater Boston has one of the world's largest concentrations of educational institutions, whose training of highly-skilled personnel and conduct of advanced research supports the region's for-profit companies. Many of the region's most successful companies were created by ideas and people emerging from these institutions. The region's concentration of talent also feeds export-based "knowledge-based services" firms in engineering, consulting, law, and architecture, whose specialized expertise helps firms in other clusters grow and compete.
- *Financial services.* Boston is one of the nation's major financial centers, with particular strengths in mutual funds and other asset management, insurance, and venture capital. Lending and investment by this cluster supports companies in the region's other clusters, and is a particular benefit for small growth companies emerging from the region's research base.
- *Information technology.* Pathbreaking research and astute investment from the above clusters have created over the past several decades in Greater Boston a large cluster of companies focused on the storage, manipulation and transmission of information through computer hardware and networking equipment, audio, video and data communications equipment, and computer software. Sophisticated customers in the financial and knowledge

services and the defense clusters have helped spur new innovations in this cluster.

- *Health care.* Greater Boston is the nation's largest center of health research, and is one of the premier patient care centers of the world. Medical and educational institutions in the cities of Boston and Cambridge alone attracted $662 million of federal health research grants in fiscal year 1992, and the region's hospitals attract patients from throughout New England, the U.S., and the world. This concentration is generating rapid growth of private firms that develop and produce medical instruments, equipment, and biotechnology-based drugs and other products.

Figure 13A shows these clusters' employment, wages and "location quotient," or the concentration of that industry's employment in the region compared to an average of 1.00 statewide. Other important clusters and industries in Greater Boston include: defense, where the region has a strong concentration in both manufacturing and in military-related research; other manufacturing, with a diverse array of firms making everything from machine tools to shaving razors and including major concentrations in printing and publishing and instruments; and tourism, serving visitors coming to the region for vacations, conventions, or business.

Ties to Other Massachusetts Regions

The success of Greater Boston's economy and the quality of the region's infrastructure and services have a direct impact on the health of the other regions of Massachusetts, and on the other New England states.

Even though Greater Boston contained less than half of the state's 6 million inhabitants in 1990, it contained two thirds of the state's 2.4 million jobs in 1991. Data on journeys to work from the 1990 Census indicate that roughly 300,000 residents of neighboring states and other regions of Massachusetts traveled to work in Greater Boston. At the same time, thousands of Greater Boston residents traveled to work in these areas.

Greater Boston's industries also are closely tied to those of other regions. The financial and knowledge services clusters provide services to companies and individuals all over the state. Defense, computer, and other manufacturing firms in the region depend on metal fabrication and machinery suppliers in the Pioneer Valley and Central Regions, and some Greater Boston firms are suppliers to larger firms in these areas and the Northeast and Southeast Regions.

Some of the infrastructure in Greater Boston serves other Massachusetts regions and much of New England. In particular, Logan Airport is a resource whose importance spreads far beyond Boston. Its national and international passenger and freight services are far more extensive than those at any other New England airport. They are a critical resource for all of Massachusetts in an economy where people and goods must move rapidly around the world. Efforts to make the airport more accessible and more efficient, such as the Central Artery/Third Harbor Tunnel project and the Logan modernization program, are a top priority for the Commonwealth. They will have a beneficial effect on businesses and individuals throughout Massachusetts who rely on Logan for the long distance transport of products, mail, and people.

GREATER BOSTON REGION
PRIVATE SECTOR EMPLOYMENT BY SELECTED INDUSTRY CLUSTERS
1991 Annual Average

INDUSTRY TITLE	Employment	Average Wage	Percent of Total Private Employment	Location Quotient
TOTAL PRIVATE SECTOR	1,395,690	$30,524		
INFORMATION TECHNOLOGY	112,600	$43,319	8.07%	1.11
Computer Services	32,290	$46,496	2.31%	1.39
Telecommunications	37,150	$41,856	2.66%	1.06
HEALTH CARE	176,190	$30,568	12.62%	1.00
Biotech & Med instruments	14,220	$39,155	1.02%	0.99
Health Services, Private	161,970	$29,814	11.61%	1.00
KNOWLEDGE CREATION	140,140	$40,688	10.04%	1.37
Colleges & Universities	56,270	$31,025	4.03%	1.38
FINANCIAL SERVICES	102,020	$39,638	7.31%	1.22
Depository Institutions	43,140	$29,756	3.09%	1.17
Security/Commodity Brokers	21,430	$65,956	1.54%	1.62
Insurance Carriers	32,280	$36,198	2.31%	1.09
OTHER MANUFACTURING	152,690	$36,604	10.94%	0.73
Printing & Publishing	28,180	$34,302	2.02%	0.99
Instruments	25,230	$42,962	1.81%	1.26

Figure 13A

Subregions of Greater Boston

The Greater Boston Region can be divided into five distinct areas:

- The North Shore is the area along the Atlantic coast between Boston and Rockport. This subregion contains older industrial cities, historic seaports, and wealthy suburban enclaves. The North Shore economy had 144,000 jobs in 1991, and its total population was 381,800 in 1990.
- The Metro North subregion, just north of Boston, consists of a cross-section of urban areas including the education and research center of Cambridge, bedroom

communities and large suburban industrial parks on Route 128. Total population was 718,143 in 1990, and total employment was 310,000 in 1991.

- The Boston subregion is the city of Boston, Massachusetts' capital, its largest city, and its center of services and finance. With just over 500,000 jobs in 1991 and a total population of 574,283 in 1990, Boston draws workers from around and beyond the region.
- The Metro West subregion is bounded by Route 128 and Interstate 495, and includes some of the area's older and wealthier communities as well as industrial and commercial developments that developed in the 1970s and 1980s around computers, instruments and other "high-tech" industries. Its total employment was 451,000 in 1991, and population was 819,138 in 1990.
- The South Shore subregion extends along the coast from Quincy to Duxbury. Some of the towns of this subregion are primarily bedroom communities, but Quincy and Braintree in particular contain substantial employment in trade, finance, insurance and services. The South Shore's total population was 412,558 in 1990, with employment of 166,000 in 1991.

These five subregions together represented 48.3 percent of the population of Massachusetts as of 1990, with a total population of 2,905,922. Total employment in the region was 1,608,790 in the fourth quarter of 1991.

Population Characteristics

The population of the Greater Boston Region increased by only 36,258 between 1980 and 1990, or approximately 1.2 percent. This was well below the 8.5 percent population growth rate in the rest of the state; the region accounted for only 15 percent of the state's total population growth during the decade.

Population growth was fastest in the region's outlying towns such as Franklin and Ashland. This resulted from availability of land, relatively low housing costs during a period of rapidly increasing prices, and strong job growth along Route 495. These towns ranked among the fastest-growing communities in the state during the decade. Much of the population growth in the state occurred in adjacent communities just outside Greater Boston's boundaries. Figure 13B illustrates the region's pattern of population growth in the 1980s.

Population also grew in some of the region's oldest cities, which absorbed an influx of Asian, Hispanic and black immigrants. The city of Boston's population grew for the first time in decades, attracting both minorities and young professionals to its varied neighborhoods. The city of Boston's addition of 11,289 residents accounted for nearly one third of the region's net population increase.

Greater Boston's established suburbs experienced little or no population growth, reflecting smaller household sizes as the population aged, house prices which were too high for young families, and a lack of land for new housing construction. Population loss was not tied to economic decline. Some of the towns with the greatest population loss, such as Weston and Belmont, are among the state's wealthiest communities.

Greater Boston's minority population in 1990 was just over 420,000, accounting for 16.1 percent of the region's total population (See Figure 13C). Minorities are concentrated in a few areas. Of the five subregions, all but Boston are overwhelmingly white. Boston has large black, Hispanic and Asian populations, which together represent 41 percent of its total population. Cambridge, Lynn, and Chelsea also have minority populations that constitute over 10 percent of their totals. Many of these minority residents are recent immigrants from the Caribbean, Asia or Latin America. The minority population of the region increased by 145,000 from 1980 to 1990, while the white non-Hispanic population dropped by about 109,000.

Per capita income in Greater Boston varies widely by race and ethnic group. The region's average per capita income in 1989 was $19,542, an impressive 33 percent increase in real terms since 1979. However, as shown on Figure 13D, the average

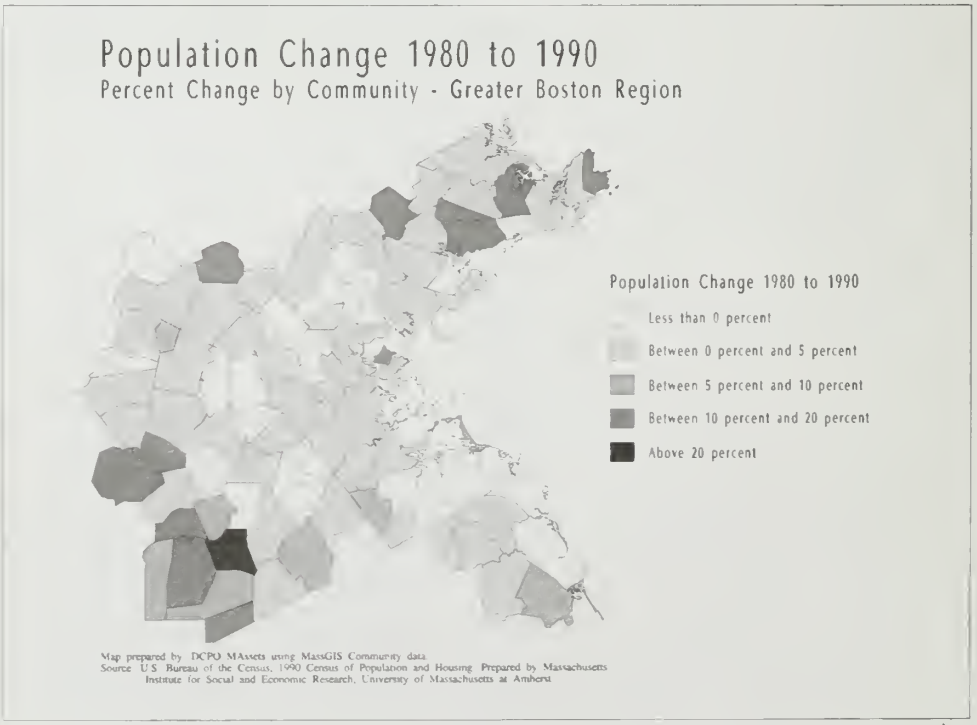

Population Change 1980 to 1990
Percent Change by Community - Greater Boston Region
Population Change 1980 to 1990
Less than 0 percent
Between 0 percent and 5 percent
Between 5 percent and 10 percent
Between 10 percent and 20 percent
Above 20 percent
Map prepared by DCPO MAssets using MassGIS Community data
Source U.S. Bureau of the Census, 1990 Census of Population and Housing. Prepared by Massachusetts Institute for Social and Economic Research, University of Massachusetts at Amherst

Figure 13B

The Greater Boston Region is one of the world's leading centers for biomedical research and product manufacturing, building upon its incomparable universities and teaching hospitals. *Photo courtesy of Beth Israel Hospital*

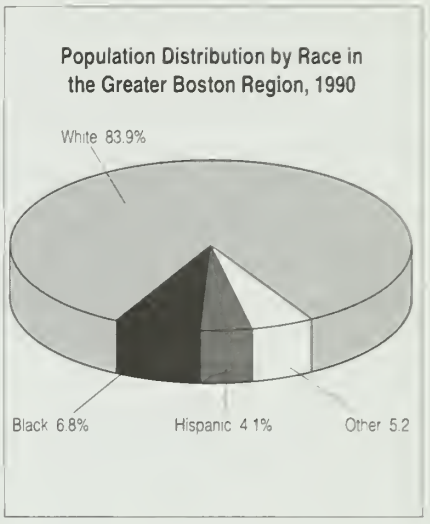


Figure 13C

income per capita for blacks in the region was only $11,288, and for Hispanics $9,431, compared to an average of $20,728 for whites.

Educational Attainment

One of the most important demographic factors determining the economic potential of a region is the educational background of its workforce. Educational attainment in the Boston region improved substantially in the 1980 to 1990 period, with the percentage of the over age 25 population who had at least some college education rising from 40 percent to 55 percent. The percentage who held college and graduate degrees rose from 25 percent in 1980 to 33 percent in 1990, far above the 1990 U.S. average of 21.3 percent (See Figure 13E).

The region's educational attainment varies by race. While 34.5 percent of the white population and 47.3 percent of the Asian population over age 25 had obtained bachelor's or higher degrees in 1990, only 17.9 percent of blacks and 18.4 percent of Hispanics had done so. In addition, 29.7 percent of blacks and 41.4 percent of Hispanics over the age of 25 had not graduated from high school, compared to 14.6 percent of whites. This reflects, in part, a large number of recent immigrants who had not had the opportunity to obtain an education in their country of origin, but it also reflects the high dropout rates in many of the region's school systems. These numbers indicate a need to properly educate both minority youth and older immigrant populations.

INDUSTRY AND EMPLOYMENT TRENDS

Recent Developments

Greater Boston has experienced dramatic extremes of growth and contraction over the past decade. In the 1983 to 1988 period, the region added 230,000 jobs, with gains made in every sector of the economy except manufacturing, which lost almost 34,000 jobs. Particularly large increases came in construction, which grew by 60 percent and added nearly 28,000 jobs; in retail and wholesale trade, which added over 57,500 jobs; in finance, insurance, and real estate, which grew by over 35,000 jobs; and largest of all, services, which increased by over 25 percent and added 113,000 jobs to the region's economy. Much of this growth was related to a speculative boom in residential and commercial real estate development, but substantial growth also occurred in export-based financial and business services such as asset management, higher education, research, and management consulting.

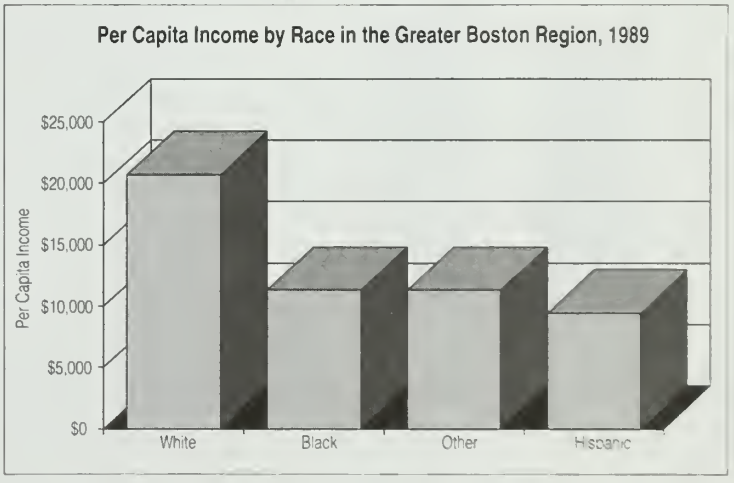


Figure 13D

Figure 13F contrasts the growth of the 1983 to 1988 period to the retrenchment of the subsequent 1988 to 1991 period. Between the fourth quarter of 1988 and the fourth quarter of 1991, total private employment in the Greater Boston region declined 11.3 percent, while government employment dropped 6.4 percent (See Figure 13F). Job losses totalling 192,000 occurred in virtually all sectors of the economy, although three sectors — manufacturing, retail trade, and construction — accounted for almost two thirds of the decline. The loss of manufacturing jobs begun in the previous period

continued at a faster pace, with a further 54,000 decline. Over 27 percent of the region's manufacturing jobs were lost from 1983 to 1991. Retail trade had the second highest job loss (36,340), followed by construction (32,470).

A few industries did continue to add jobs during this period. Private health services employment increased 10.1 percent, social services rose 5.1 percent, and private educational and legal services each rose about 1 percent. There also were employment increases in security and commodity brokers, insurance agents and brokers, and air transportation.

Industry Profiles

Health Care

Greater Boston's health care cluster is world-renowned for its quality of treatment and pathbreaking research. The cluster includes hospitals, home health care firms, nursing and personal care facilities as well as biotechnology and pharmaceutical firms, medical research institutes, medical instruments manufacturing, and medical laboratories. These industries are closely intertwined.

At the center are Boston's teaching hospitals, which serve as training grounds for medical students, major centers for medical research, a source of spin-off biotechnology and medical products companies, and testing sites for the latest innovative technologies and procedures developed by these researchers and companies. These include Brigham and Women's Hospital, Children's Hospital, Dana Farber Cancer Center, Massachusetts General Hospital and others.

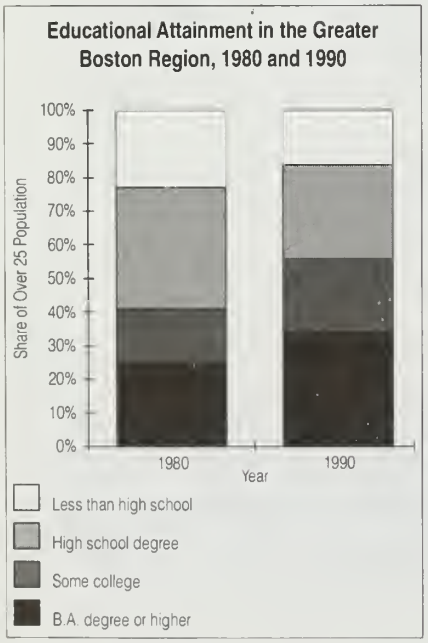


Figure 13E

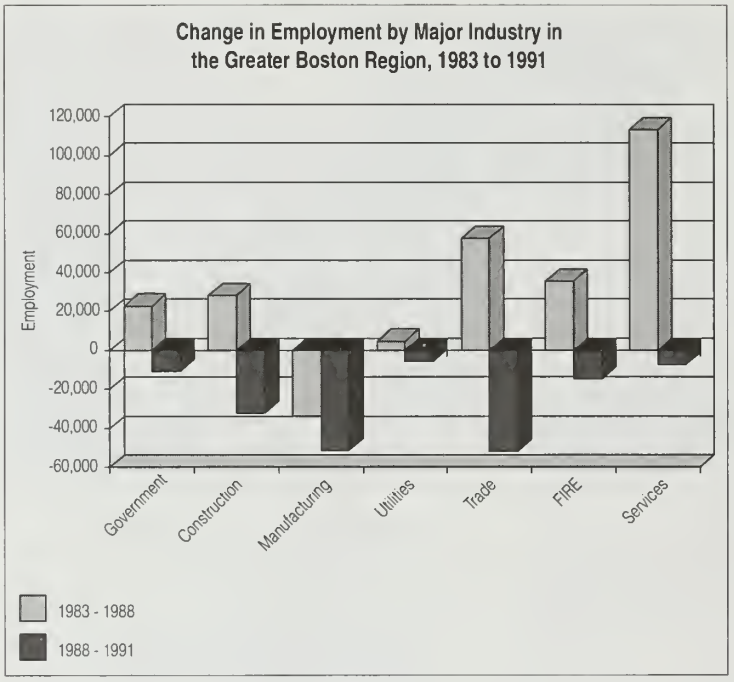


Figure 13F

Tied to these are many other university research centers, including the medical schools and science departments at Harvard, Boston University, and Tufts. Together with independent and corporate research centers throughout Greater Boston, this health research complex annually brings to the region well over $700 million of federal health research grants, along with many millions more in private nonprofit and corporate research dollars. Boston alone was the nation's largest recipient of federal health research dollars in fiscal year 1992, and Cambridge was sixteenth.

This research is spurring the growth of the region's biotechnology and medical instruments firms. Important biotechnology companies include Biogen, Genzyme, and Genetics Institute, while medical instrument manufacturers include Haemonetics, Boston Scientific, and Hewlett-Packard. Employment in biomedical technology has grown rapidly, but this is still a small industry, estimated to employ about 13,600 people statewide. As biotechnology moves out of the research and development stage to the manufacturing stage, opportunities will also expand in this area, as the Genzyme plant in Allston has illustrated.

Altogether, there were 176,000 people employed in the health care cluster in the Greater Boston region in 1991. Health care employment as a percent of total private employment in each subregion ranged from 9.7 percent in Metro West to 16.3 percent in Boston. Between 1980 and 1990, health services employment as a whole grew 2.8 percent per year. Some sectors, such as hospitals, have experienced modest growth (0.8 percent per year), while others like home health care have had employment growth of 7.6 percent per year.

Real wages per employee have also grown steadily (2.4 percent per year from 1980 to 1990), partly due to a shortage of skilled labor. Average wages ranged from $26,890 in the South Shore to $33,180 in Boston. Wages were higher than average in biotechnology and medical instruments, physicians and medical laboratories, and lower than average for home health care, nursing care facilities and other health services.

The future outlook for the health care cluster is one of sustained growth in both employment and wages. Strong growth in underlying demand for health services as the popula-

GREATER BOSTON REGION
EMPLOYMENT BY MAJOR INDUSTRY
1988 Fourth Quarter - 1991 Fourth Quarter

INDUSTRY	EMPLOYMENT CHANGE 1988-1991 FOURTH QUARTER 1988	1991	NET CHANGE	PERCENT CHANGE	PERCENT OF 1991 TOTAL EMPLOYMENT
TOTAL EMPLOYMENT	1,800,900	1,608,790	(192,110)	-10.7%	100.0%
TOTAL PRIVATE EMPLOYMENT	1,577,120	1,399,320	(177,800)	-11.3%	87.0%
AGRICULTURE, FORESTRY, & FISHING	9,420	7,390	(2,030)	-21.5%	0.5%
MINING	1,150	440	(710)	-61.7%	0.0%
CONSTRUCTION	74,170	41,700	(32,470)	-43.8%	2.6%
MANUFACTURING	278,280	224,260	(54,020)	-19.4%	13.9%
Printing & Publishing	32,400	27,970	(4,430)	-13.7%	1.7%
Industrial Machinery & Equipment	48,566	35,530	(13,036)	-26.8%	2.2%
Electronic & Other Electrical Equip.	46,180	35,800	(10,380)	-22.5%	2.2%
Transportation Equipment	20,360	14,720	(5,640)	-27.7%	0.9%
Instruments & Related Products	53,990	48,120	(5,870)	-10.9%	3.0%
TRANSPORTATION & PUBLIC UTILITIES	78,260	70,430	(7,830)	-10.0%	4.4%
Trucking & Warehousing	22,080	19,750	(2,330)	-10.6%	1.2%
Transportation by Air	10,040	11,000	960	9.6%	0.7%
WHOLESALE TRADE	110,740	92,240	(18,500)	-16.7%	5.7%
Wholesale Trade Durable Goods	70,650	58,050	(12,600)	-17.8%	3.6%
Wholesale Trade Nondurable Goods	40,090	34,180	(5,910)	-14.7%	2.1%
RETAIL TRADE	301,540	265,200	(36,340)	-12.1%	16.5%
General Merchandise Stores	33,600	25,880	(7,720)	-23.0%	1.6%
Eating & Drinking Places	79,450	71,480	(7,970)	-10.0%	4.4%
FINANCE, INSURANCE & REAL ESTATE	154,140	138,030	(16,110)	-10.5%	8.6%
Depository Institutions	51,030	41,570	(9,460)	-18.5%	2.6%
Security & Commodity Brokers	17,871	21,820	3,949	22.1%	1.4%
Insurance Carriers	33,830	31,820	(2,010)	-5.9%	2.0%
Real Estate	26,264	19,400	(6,864)	-26.1%	1.2%
SERVICES	569,420	559,630	(9,790)	-1.7%	34.8%
Hotels And Other Lodging Places	21,010	20,070	(940)	-4.5%	1.2%
Business Services	121,020	105,320	(15,700)	-13.0%	6.5%
Health Services	149,790	164,870	15,080	10.1%	10.2%
Legal Services	19,740	19,910	170	0.9%	1.2%
Educational Services (Private)	70,860	71,610	750	1.1%	4.5%
Social Services	36,340	38,200	1,860	5.1%	2.4%
Engineering & Management Services	79,040	75,300	(3,740)	-4.7%	4.7%
GOVERNMENT	223,780	209,470	(14,310)	-6.4%	13.0%
FEDERAL	34,740	34,230	(510)	-1.5%	2.1%
STATE	68,360	61,270	(7,090)	-10.4%	3.8%
Health Services (Public)	5,970	4,240	(1,730)	-29.0%	0.3%
Educational Services (Public)	9,180	8,730	(450)	-4.9%	0.5%
Administration of Human Resources	14,350	13,232	(1,118)	-7.8%	0.8%
LOCAL	120,960	113,970	(6,990)	-5.8%	7.1%
Health Services (Public)	8,670	7,000	(1,670)	-19.3%	0.4%
Educational Services (Public)	66,820	63,680	(3,140)	-4.7%	4.0%

SOURCE:Massachusetts Department of Employment and Training, Employment and Wages.
NOTES:Data represent jobs covered by Unemployment Insurance laws. Data are not adjusted for non-economic changes in industry or geographic coding that may have occurred between the comparative periods.
C= CONFIDENTIAL DATA. N.E.C.= NOT ELSEWHERE CLASSIFIED.

Figure 13G

tion ages will stimulate moderate expansion in hospitals in spite of efforts by insurance companies to reduce the length of stay. Home health care employment will also expand considerably because caring for patients in their own homes is often less expensive than caring for them in hospitals. New discoveries and new applications of existing knowledge will continue to spur strong growth in biotechnology and medical instruments.

The prospect of insurance reform may mitigate the cluster's overall growth, though at this point it is impossible to pinpoint what areas of health care would be most affected by efforts to reduce health care spending.

Knowledge Creation

Greater Boston's knowledge creation cluster includes advanced educational institutions, research and development laboratories, institutions specializing in basic research, think tanks, consulting firms, law firms, engineering firms, printing and publishing companies, and advertising and market research organizations. The basis of competition in this cluster is the creation of innovative new ideas performed by a creative, entrepreneurial and highly skilled workforce.

Knowledge creation is closely connected to other industry clusters in Greater Boston. For example, research firms work with the electronics and computer industries on materials, hardware and software. Advances in these other industries have made increasingly sophisticated measurement and modeling procedures possible. Information is disseminated by the printing and publishing industry. In addition, students of the prestigious medical schools in the Boston area become employees within the health care cluster.

In 1991, the knowledge creation cluster in Greater Boston employed 140,140 people. This represents approximately two thirds of the total employment in this cluster for Massachusetts as a whole. By subregion, Boston had the largest number of people employed in the cluster, with 55,810 or 13.7 percent of its total private sector employment. Metro North was a close second with employment of 47,120, or 15.2 percent of its total private sector employment. In contrast, only 2,660 people were employed in knowledge creation in the North Shore subregion, or 2.1 percent of its total.

Greater Boston contains over 100 colleges and universities, including Harvard, the Massachusetts Institute of Technology, Boston University, Northeastern, and Tufts. These institutions not only serve as a source of ideas and talented people, but are major employers who "export" services by drawing students from around the nation and the world. Employment in private higher education institutions in the Greater Boston region increased slightly between 1988 and 1991, with over 71,000 jobs in the fourth quarter of 1991.

Research, development and testing labs such as Lincoln and Draper Laboratories and MITRE also bring money into the region (they received 9 percent of nationwide Defense Department R&D contracts in 1989) and create further economic growth through technology transfer. Consulting firms such as Arthur D. Little, the Boston Consulting Group, Bain and Company, and the Monitor Company serve clients around the world. Legal employment was stable during the 1988 to 1991 period, with growth in some areas balancing loss of real estate-related business.

Between 1988 and 1991, almost 5,000 jobs were lost throughout the state in engineering and architectural services. Those that serve primarily local clients were severely affected by the real estate and construction bust, and the firms with worldwide clients, such as Stone and Webster and Camp, Dresser and McKee, suffered from industry trends such as the discontinuance of nuclear power plants and slower growth in demand for water and waste treatment plants.

The outlook for the knowledge creation cluster as a whole is highly positive, both in terms of job growth and wages, as the global economy continues to become more and more information-based. The DET projects employment gains of 6.2 percent for universities, 48.1 percent for legal services, 32.1 percent for engineering services, 49.0 percent for research and testing services and 37.6 for management and public relations services from 1991 to 2005. However, other parts of the country, particularly northern California, New York, and the Southeast, are continuing to build strong research and development capability, and it is important that Massachusetts strive to maintain its competitive position.

Information Technology

The information technology cluster is composed of a diverse group of industries, including computers, software, peripherals, information technology services, information retrieval services, communications equipment and services, precision instruments and electronic components.

Greater Boston's information technology cluster had total employment of 112,600 in 1991. Computer, audio and video equipment, and electronic components manufacturing employed about 43,000 in 1991, or 38 percent of total employment in the cluster. Software, data processing and other computer services represented 28.6 percent of the cluster with 32,000 jobs, and 37,000 jobs in the communications represents 33 percent of total cluster employment.

Industries within this cluster are strongly interdependent. Electronic components and precision instruments are needed for the manufacture of computers, peripherals and communications equipment, and information providers rely heavily on the communications industry to provide the means to transmit information. Information technology also has significant linkages with other clusters such as the financial services cluster for venture capital, and health care, knowledge creation and financial services are all customers of computer manufacturers and software firms.

Within the Greater Boston Region are the headquarters, research and/or manufacturing facilities of such large firms as Digital Equipment Corporation, Hewlett Packard, Analog Devices, Bolt Beranek and Newman, and Lotus. Scores of smaller firms are serving niche markets and creating new tech-

Greater Boston Regional Profile

Greater Boston's information technology cluster has helped create an advanced communications infrastructure to support the state's leadership as a center for learning, new technology, and innovation. Photo of Network Operations Center in Framingham. *Photo courtesy of New England Telephone.*

nologies. Employment by subregion ranges from a low of 4,530 people in the South Shore to a high of 64,550 in Metro West. Information technology represents only 3 percent to 4 percent of total employment for the North Shore, Boston and the South Shore, 7.9 percent in Metro North, and 16 percent in Metro West. Wages are significantly higher than average in all subregions, ranging from $35,230 in the North Shore to $44,850 in Metro West.

Due to a combination of recession and industry-specific trends, the information technology cluster as a whole lost 30,000 jobs in Greater Boston between 1988 and 1991. Job losses were concentrated in computer and office equipment manufacturing (15,000 jobs lost) and semiconductor manufacturing (6,000 jobs lost). Times have continued to be difficult for companies like Digital Equipment Corporation of Maynard and Computervision of Bedford. In late 1992, Digital announced worldwide layoffs of 20,000; many of which are likely to occur in Greater Boston. One casualty has been the firm's cable manufacturing plant in the Roxbury section of Boston, an important employer in this depressed inner city neighborhood. On the other hand, Digital's commitment to regaining its technological edge and maintaining an important presence in the region is illustrated by the $100 million semiconductor plant under construction in Hudson to produce the firm's next generation of chips.

Downsizing and industry consolidation will probably continue on the hardware side of computers, but several Greater Boston firms are leaders in important niche markets. Prominent firms include Stratus Computer of Marlborough, a world leader in fault-tolerant systems, and two leaders in massively parallel supercomputers, Thinking Machines of Cambridge and Kendall Square Research of Waltham.

Over the same period that the region's computer hardware firms were reducing payrolls, Greater Boston's prepackaged software firms created 3,000 new jobs, increasing employment by 46 percent. Software companies are taking advantage of layoffs to hire new talent and vacant office buildings to rent relatively cheap space. New companies are being started constantly, some of them by people laid off by the region's large computer firms. According to the DET, computer and data processing services is one the state's fastest-growing industries, with employment growth of 90.3 percent anticipated from 1991 to 2005.

The region's computer and communications industry are increasingly tied together through advances in data networking systems. Massachusetts is a world leader in the fast-growing internetworking equipment industry, with about 15 firms in Greater Boston and adjacent regions holding a nearly 50 percent share of the world market. Networking hardware and software have long been a strength of the region's minicomputer firms; today, networks are attempting to link disparate computers of many sizes and makes. Firms such as Chipcom of Southborough and Wellfleet Communications of Bedford are thriving in rapidly expanding markets. Other areas of communications where Greater Boston firms are market leaders include voice mail, where Boston Technology of Wakefield has secured a major contract with Nippon Telephone and Telegraph, and videoconferencing, where Picturetel of Peabody has carved out a substantial share of a competitive market.

Financial Services

The financial services cluster includes many distinct industries, including mutual fund and pension fund management, venture capital, life and property/casualty insurance, commercial banking, savings and loans, and real estate. Although some of the firms in these industries compete only locally, many have strong national and global positions. Industries in this cluster are not only interrelated, but also serve as an important link to other clusters in providing capital and other financial services.

In 1991, there were 102,020 people in Greater Boston employed in financial services. Financial services represented 14.1 percent of total private employment in the city of Boston and 9.5 percent on the South Shore, which houses many back-office operations of Boston banks. The North Shore, Metro North and Metro West areas had only 3 to 4 percent of their employment in financial services.

Average wages for the cluster as a whole were below average wages for private employment as a whole in three of the subregions—only in Boston and the South Shore were financial services wages higher than total private employment wages. Average wages for the cluster ranged from $13,950 in the North Shore to $48,650 in Boston. Within the cluster, the highest wages are in security and commodity brokers and other security services, foreign banks and agencies and business credit institutions. These high-wage financial activities are located predominantly

in the city of Boston, which is why wages are so much higher there. The South Shore also has some financial businesses that have high regional concentrations and pay relatively higher wages such as commercial banks, non-depository institutions, mortgage bankers and brokers and medical and health insurance providers.

Many of the industry's sub-sectors have come under pressure in recent years, due to both cyclical and structural factors. Specifically, real estate has faced severe difficulties due to an oversupply of space and weak demand related to the recession. With respect to banking, the real estate bust and recession have led to a large number of non-performing loans (60 percent of which were real-estate-related in 1991), and has even caused one of the region's largest banks, the Bank of New England, to be declared insolvent in 1991. Competition from other types of financial institutions and overcapacity have put downward pressure on bank margins, and this is likely to continue. The banking crisis has led to a credit crunch, which has affected the ability of smaller firms in the Commonwealth to finance their operations and plan their growth. However, recent improvement in banks' balance sheets may be leading to stronger lending activity.

On the more positive side, Boston-based asset managers did well in the 1980s; a trend which is expected to continue as more people turn to high-return alternatives to traditional savings accounts to fund their children's educations and their own retirement. Employment in credit institutions and investment offices are projected to grow 42.5 percent, and security and commodity brokers 30.7 percent, between 1991 and 2005, according to Massachusetts Department of Employment and Training estimates.

Greater Boston's life insurance firms are well-positioned and have high credit quality ratings, though cost pressures have led to increased automation and reduction of payroll. Employment in insurance carriers is expected to grow only 8.4 percent between 1991 and 2005.

Defense, Instruments and Other Manufacturing

Manufacturing other than that which forms part of the information technology and medical clusters discussed above remains a significant employer in the Greater Boston Region. In the North Shore subregion, these manufacturing sectors represented 18.8 percent of total private employment in 1991. This compares to 6.5 percent of the city of Boston's employment. In total, there were 152,690 people employed in these manufacturing industries throughout the Greater Boston Region, which was 11 percent of the region's total private employment.

Sectors within manufacturing that lost fewer jobs than average over the 1988 to 1991 period were printing and publishing and instruments and related products. Sectors that fared poorly included transportation equipment, linked closely to defense contracts. Average wages in the manufacturing sector ranged from $31,160 in the South Shore to $39,180 in Metro West; considerably higher than average private sector wages in all five subregions.

Employment in manufacturing in the North Shore is strongly related to the fortunes of the military aircraft industry. Local companies manufacture precision machine tools to make aircraft components and assemblies, instruments and systems for aerospace application, as well as producing the electrical and electronic components themselves. The GE Aircraft Engine division of General Electric makes aircraft engines and engine parts, and is by far the largest single employer in the area, with approximately 6,000 people (one quarter of total manufacturing employment in the subregion). The subregion's manufacturing base is not all related to defense, however. The Gorton Group division of General Mills employs over 1,000 people in Gloucester making frozen and canned seafood. NYNEX Information Resources Company, publishing telephone directories, is also a significant employer in the region.

Metro North's manufacturing employment is highly concentrated in high technology industries such as electronic components, guided missiles, search and navigational equipment, measuring and controlling devices, and photographic supplies and equipment due to the presence of Polaroid. Much of this manufacturing capacity has expanded by serving the defense industry, and is now under stress due to the defense industry's ongoing downsizing efforts. Other major employers in the area include Stride Rite and the Fasteners Division of TRW, Inc.

The manufacturing base in Boston is primarily concentrated in printing and publishing, fabricated metals, food, apparel and other textile products, instruments and electronic components and accessories. More than one third of manufacturing jobs are in printing and publishing. Major employers include Gillette (razors and personal care products), Houghton Mifflin and Little Brown (book publishing), Connell Ltd. Partnership (machine tools), and Teradyne (automatic test systems).

Metro West's manufacturing is concentrated in precision instrument industries, defense, and computers. The instrument firms make measuring and controlling devices and laboratory instruments and apparatus, used primarily in guided missile systems and medical establishments. Major employers include GTE, Raytheon, Bose, and Northrop, among many others.

The South Shore's manufacturing tends to be concentrated in older established companies, with high technology manufacturing representing only 3.2 percent of the total. In 1986, the closing of the General Dynamics shipyard in Quincy accounted for the majority of the subregion's job losses during the 1980s. Large manufacturing employers in the area include Boston Gear (enclosed gear drives, motors, gears and bearings), Howes Leather Company (leather soles and cut leather stock), and Pneumatic Scale Corporation (automatic packaging and bottle machinery).

The Greater Boston Region also contains important non-manufacturing defense employment, both in research and development and in military and civilian personnel

directly employed by the Department of Defense. Federally-funded private defense research centers include MIT and its Lincoln Laboratory in Lexington, Draper Laboratory in Cambridge, and MITRE Corporation in Bedford. Raytheon Corporation also has an extensive research division. Together, they bring several hundred million dollars of federal grants into the region. It is expected that these centers will lose federal research contracts as the Defense Department pulls work into government-owned labs. A few of these labs are in Greater Boston, including the Army Materials and Mechanics Research Center in Watertown, and Army and Navy Research centers in Natick.

The Department of Defense has substantial other direct employment in the region. Hanscom Air Force Base in Bedford employs over 4,000 personnel, while another 500 are at the South Weymouth Naval Air Station. There is substantial military employment in Boston, Cambridge and Waltham as well.

Tourism

Visitors to the Boston area are an important source of jobs, income, and economic vitality for the region and the Commonwealth. Visitors may be classified as tourists, group visitors to conventions and meetings and individual business visitors. Each of these three types offer particular economic benefits for the region and are an integral part of Greater Boston's hotel industry. According to the U.S. Travel Data Center, the Boston Metropolitan area generated over $4.6 billion in travel expenditures in 1990; almost $3.5 billion of it in the City of Boston alone. Travel-generated payroll in metro Boston was over $1 billion. Approximately 10 percent of visitors came from other countries.

Tourists account for one third of the total economic impact of Greater Boston's visitor industry and one fifth of all hotel room nights sold. The major tourist attractions in Greater Boston include Fanueil Hall Marketplace, the USS Constitution, the New England Aquarium, the Children's Museum, the Museum of Science, and the Museum of Fine Arts in Boston; Minuteman Historical Park and Walden Pond in Concord; the Peabody Museum, Essex Institute, Witch House and other attractions in Salem; and the seaside resorts of Cape Ann.

Just under half of hotel room nights sold in Boston are for business travelers. Even though companies are trying to cut costs by reducing their travel budgets, the information-based service industries that are centered in the Boston area often require face-to-face contact between clients and service providers, which often offsets this trend.

The number of convention visitors has been growing in recent years, in part because convention-trade capacity in Boston has been upgraded over the last five years with the completion of the Bayside Exposition Center, the World Trade Center and the expanded Hynes Convention Center. Boston attracts both trade shows and business and professional association meetings. Because of the area's industry specializations, it is particularly well-suited to meetings related to health care, the computer industry, and higher education. The newer hotels have substantial meeting facilities.

Boston lacks a facility capable of handling the nation's largest conventions, which can bring over 10,000 visitors to a city with large economic impact. The Commonwealth is studying the feasibility of building a combination convention center and stadium which could accommodate such events.

COMPARATIVE ADVANTAGES OF THE GREATER BOSTON REGION

Location and Infrastructure

Greater Boston derives great benefits from its strategic location and diversified infrastructure. Boston and the area around it are serviced by air, freight and passenger rail, highway, port and transit systems. International, regional and general aviation airports can be found within a short drive, including Logan International Airport, Hanscom Field, and Marlborough Airport. Logan is the largest airport in New England and one of the largest in the world, with more than 25 commercial airlines and 15 commuter airlines transporting about 22 million passengers annually. Logan is serviced by more than 50 air freight companies.

The Port of Boston is one of the nation's oldest trading centers, with more than 25 million tons of cargo worth more than $7 billion passing through annually. It has a natural deep water harbor with 40 foot channels, modern terminal facilities (23 private terminals and three public terminals owned and operated by the Massachusetts Port Authority), with interstate highway connections to New England, the Mid-Atlantic, the Midwest, and Canada and railroad connections via ConRail and Boston and Maine Railroad. A partnership between Canadian Pacific and the Boston and Maine Railroad will provide direct rail service between the Port of Boston and points west via a new intermodal facility at Fort Devens.

The region's major highways are I-90 for east-west links and I-495 for north-south links. Freight rail is supplied by ConRail and Boston and Maine. Passenger rail is available on Amtrak to New York, Springfield, Albany and points west. An extensive network of commuter rail, subways, streetcars and buses is run by the Massachusetts Bay Transit Authority (MBTA) and by private bus carriers.

Investment

Both new and established businesses in Greater Boston benefit from Boston's status as a regional financial center. Many of Boston's financial businesses, in fact, serve a national and international customer base, including Boston's venture capital industry, mutual fund businesses, and institutional investors. The presence of these financial resources has been instrumental in allowing entrepreneurs to turn their ideas into new companies in a variety of emerging fields.

Educational Resources

Greater Boston has an unequalled concentration of higher education institutions. This serves as a major attraction for people to

come to Boston, both as students and as workers in the knowledge creation industry. Many students stay in the area after they graduate and become part of the state's resource base of highly skilled, well-educated workers and business owners. The educational resources of the region also provide valuable opportunities for technology transfer, which promotes continuing innovation on the part of local companies.

Workforce Skills and Availability

The region's large and diversified employment base is its greatest strength and the source of its future growth. Over the 1980 to 1990 period, the region experienced an impressive upgrading of its occupational mix, with the number of people in managerial positions increasing by nearly 50 percent, and the number of people in professional and technical positions also growing substantially. The extensive educational resources in the area allow a wide range of opportunities for residents to prepare for a career or a career change, or to upgrade their skills and knowledge base.

Quality of Life

The Greater Boston region is an attractive place to live, work and visit. Even beyond the capabilities of its workforce and industries, the area benefits from a rich history, excellent access to recreational opportunities, and a strong cultural life, which attracts people to move to and stay in the area.

CHALLENGES TO FUTURE GROWTH

Infrastructure

While Greater Boston has an extensive infrastructure network, its age and quality represent a challenge to future growth. The Harbor Cleanup and Central Artery/Third Harbor Tunnel megaprojects are massive undertakings designed to rectify the region's worst infrastructure problems. Traffic through Logan Airport doubled in the 1980s, and it requires major improvements to better accommodate present and future demand. Options for a second airport to relieve congestion are still being weighed. The Port of Boston suffers from a lack of direct rail access, and businesses have historically incurred higher rail transportation costs than average in the region because low bridge clearances prevent double-stacking of containers on railroad cars. Finally, the region's public transportation does not adequately serve some of the areas whose population and employment grew fastest during the 1980s.

The region's large and diversified employment base is its greatest strength and the source of its future growth. Over the 1980 to 1990 period, the region experienced an impressive upgrading of its occupational mix. The extensive educational resources in the area allow a wide range of opportunities for residents to prepare for a career or a career change, or to upgrade their skills and knowledge base.

Educational Resources

While Greater Boston's resources at the college and university level are outstanding, the region suffers from wide variations in the quality of its primary and secondary schools. Some of the state's best school districts and some of its worst are within a few miles of each other within the region. For example, standardized test scores, dropout rates and number of children going on to college are among the lowest in the state in Boston and Chelsea, and among the highest in the state in Lexington and Weston.

Workforce Skills and Availability

In the short run, the shake-out of the minicomputer industry and problems within financial services are causing significant unemployment in the region. Many of the jobs that have been lost have been related to the downsizing of the defense industry, and this is a trend that is likely to continue. In many cases, the workers that have lost their jobs are highly skilled, and if not retrained and reemployed, represent a resource that the region could lose. However, the ranks of the unemployed also include people who lack real prospects for employment because they don't have the basic skills needed in today's competitive world. Both groups need to be able to access the area's educational resources in order to prepare for both new careers and first jobs.

Distressed Areas

While Norfolk and Middlesex Counties both had per capita incomes approximately 18 percent above the statewide average of $17,224 in 1989 (according to the 1990 Census), the same cannot be said for Suffolk County, with a per capita income of $15,414. Specifically, Boston had the highest per capita income in the county, at $15,581, while Revere's was $14,723 and Chelsea's was one of the lowest in the Commonwealth at $11,559. In other parts of the Greater Boston Region, the cities of Lynn, Everett and Somerville have below-average per capita incomes. Figure 13H illustrates the variations in per capita income by community.

The poverty rates of the above cities are well above the Commonwealth's 1989 poverty rate of 8.9 percent, ranging from 9.6 percent in Everett to 24.1 percent in Chelsea. Boston's poverty rate was 18.7 percent, representing over 100,000 people living below the poverty line. In 1992, both Boston and Somerville had unemployment rates below the statewide average of 8.5 percent, but many of these cities' poorest residents were not reflected in these statistics, since they had given up looking for work. Chelsea and Lynn's unemployment rates of 11.7 percent and 10.1 percent, respectively, were well above the statewide average.

Educational attainment also varies by community, reflecting racial and socioeconomic

differences. For example, in the city of Newton, 92 percent of the over age 25 population had at least a high school diploma and 57 percent had at least a bachelor's degree in 1990. In contrast, only 63 percent of the same age group in Chelsea had a high school diploma, and only 12 percent had a bachelor's degree. The city of Boston had a relatively low percentage of its population holding high school diplomas, but a relatively high percentage with a bachelor's or graduate degree. This reflects the dichotomy of Boston's population, with some neighborhoods housing well-educated professionals and graduate students, and others housing immigrant, minority, and elderly populations with low educational attainment.

REGIONAL POLICY PRIORITIES

Investment

Greater Boston has extensive financial resources which have created and supported thousands of new and small companies over the past decades. The region's economy has always prospered because of the growth of such firms. However, the region has been experiencing a credit crunch linked to falling real estate values and tightening regulations that have forced area banks to retrench. Smaller loans and venture investments have high transaction costs relative to the expected return, so financiers have largely vacated the small company market. Several of the programs described in this *Strategy* address these issues:

- Initiatives such as an Early Stage Equity Finance Program and a Small Business Capital Access Program can encourage financial institutions to return to the small company market.
- An Emerging Technology Fund would help finance the expensive manufacturing and research facilities needed by the region's technology-oriented companies.
- Phased reduction of the capital gains tax tied to the length of holding the investment would help start-up technology-related firms requiring patient capital to see them through the R&D stage.

Education

The number of poor — and poorly educated — children in cities like Boston and Chelsea is well above the state average. Without a good start in life, these children will become adults who will not be able to participate in the workforce. Several of the programs described in this *Strategy* address these issues:

- New resources linked to meaningful structural reform in areas like teacher training and professional development, and creating a core curriculum and common assessment methods, are needed to improve the local school systems that are lagging behind.
- Innovations in vocational and technical education such as apprenticeships and tech prep programs (like Boston's Project ProTech) are being pursued to improve the employment prospects of non college-bound students.
- Equalizing funding between school districts on a statewide basis will ensure that even the poorest communities in the Greater Boston Region will have resources to provide for their children's education.
- Expansion and improvement of the use of technology in education can bring new opportunities for learning, but the Commonwealth and individual communities should ensure that this technology reaches the poorer school districts.

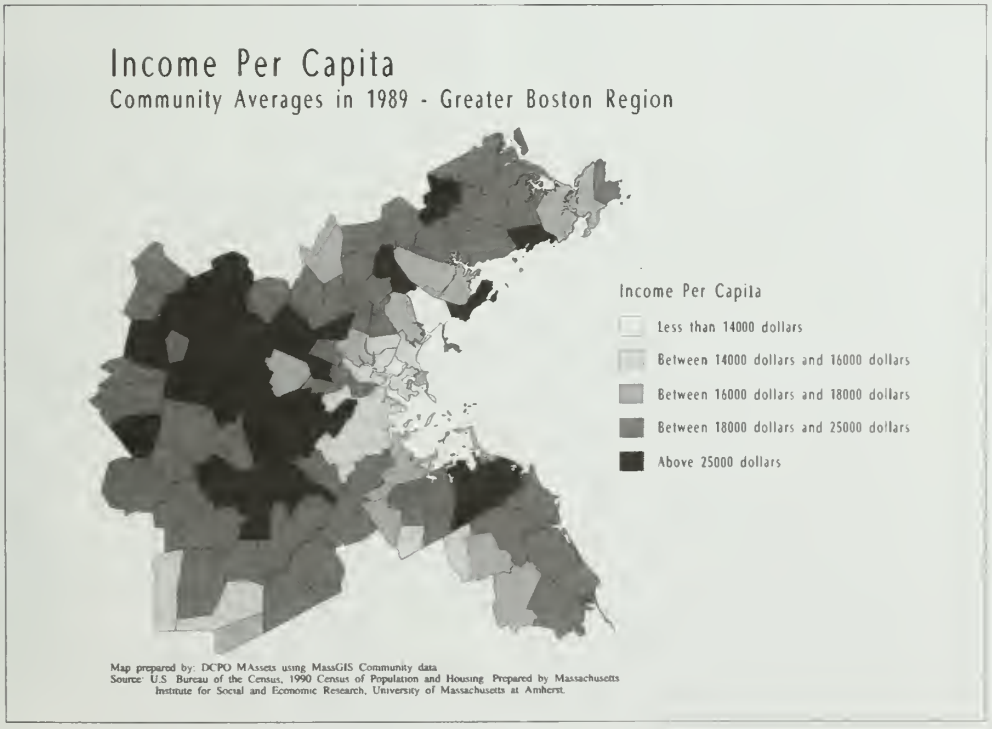

Income Per Capita
Community Averages in 1989 - Greater Boston Region
Income Per Capita
Less than 14000 dollars
Between 14000 dollars and 16000 dollars
Between 16000 dollars and 18000 dollars
Between 18000 dollars and 25000 dollars
Above 25000 dollars
Map prepared by: DCPO MAssets using MassGIS Community data
Source: U.S. Bureau of the Census, 1990 Census of Population and Housing. Prepared by Massachusetts Institute for Social and Economic Research, University of Massachusetts at Amherst.

Figure 13H

Skills Training

The Greater Boston regional economy is increasingly focused on high-value jobs requiring a high level of education and skills. It is anticipated that at least 80 percent of net new job openings during the 1990s will require at least some level of post-secondary education. Several of the programs described in this *Strategy* address these issues:

- The Commonwealth is working to create a workforce development system that is driven by the needs of individual workers and businesses rather than by the current capabilities of training providers.
- Flexible funds are needed to retrain workers in industries and companies that are

modernizing throughout Greater Boston.

- The state will establish industry-specific representatives who will work closely with firms in the region's critical industries to articulate their training needs.

Infrastructure

The Harbor Cleanup and Central Artery/Third Harbor Tunnel projects are designed to rectify the region's worst infrastructure problems. But there is more work that needs to be done to update and improve local facilities. A long-term, comprehensive approach to transportation planning in Greater Boston is important to the future growth of the region and many other parts of Massachusetts. The costs in time, money, and environmental quality of transporting people and goods in the region can be lowered through forward-looking policies and technologies that encourage energy efficiency and reduce congestion. Several of the programs described in this *Strategy* address these issues:

- The Logan Airport Modernization Program will update and replace selected facilities to accommodate increased passenger demand and the Third Harbor Tunnel construction.
- The Old Colony Restoration Project will expand commuter rail service to 23 South Shore communities along two branches of the former Old Colony System, and the MBTA will also extend the Framingham branch to connect Boston with Worcester.
- Massport has an extensive capital investment and improvement program at Conley Terminal in South Boston and the Moran Terminal in Charlestown to enhance the Port's competitive position in world markets.
- A new partnership between Canadian Pacific and Springfield Terminal/Boston and Maine Railroad will provide direct continental rail service to the Port of Boston via a new intermodal facility at Fort Devens. The Commonwealth will work with these carriers in raising bridge clearances, allowing for double stacking of freight cargo that will cut rail costs.
- The Northeast Corridor Electrification Project involves the completion of high-speed electrical rail service from Boston to New York; when completed, the trip will take 3 1/2 hours.
- The MBTA will be constructing over its railroad tracks at South Station a central bus facility for Boston with direct links to the Central Artery and Third Harbor Tunnel. This intermodal transportation center will link local, regional and nationwide bus and train services and access Logan Airport through the new tunnel.

Defense Restructuring

Any of Greater Boston's manufacturing and information technology industries have been focused on the needs of national defense. Declining defense spending has brought large layoffs in the recent past. Fortunately, Greater Boston specializes in defense-related research and development, and this portion of the defense budget will be cut less than the procurement budget. Nevertheless, many local companies are dependent on procurement, and are working to diversify their product and market bases. Several of the programs described in this *Strategy* address these issues:

- State agencies can provide technical assistance to firms seeking new markets, modernizing management and production processes and conducting strategic planning.
- State agencies can provide training and adjustment programs to help defense workers prepare for other types of employment. The North Shore Regional Employment Board (REB) is the first REB to receive funding from the Industrial Services Program for defense diversification.
- An office of Defense Diversification Coordination can help local businesses and planning officials gain access to these resources. The office also can help the Commonwealth get its fair share of resources for defense conversion coming from the federal government.
- The office should also help facilitate partnerships between local companies, universities and research centers in pursuing opportunities to create and share "dual use" technology.

Economically Distressed Areas

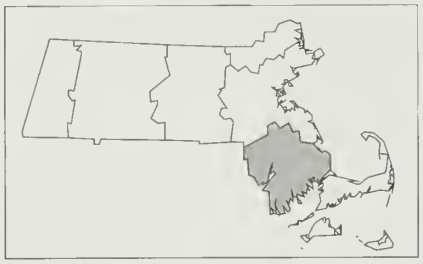
While some parts of the Greater Boston Region — the suburbs, in particular — are prosperous, cities like Boston, Chelsea, and Lynn are under stress and, as such, have trouble attracting new employers for their residents. Racism, poverty, violence, physical deterioration, and inadequately educated and trained workers lead companies to avoid locating in the inner city, or to disinvest. Several of the programs described in this *Strategy* address these issues:

- The Commonwealth should help poor areas proceed with economic development by establishing priority sites for development of industry through economic opportunity areas. EOAs can target tax incentives, permitting assistance and infrastructure investment to the areas that need it most.
- State and city governments should develop and support training programs for urban youths and adults that focus on skills needed by growing industries, such as Boston's Project Pro-Tech, which trains high school students for work in health research.
- There is a new 157,000 square foot building under construction for the Registry of Motor Vehicles headquarters at Ruggles Center. The Commonwealth's commitment will bring new economic activity to this area, anchoring a planned complex of four buildings on that site.
- The Commonwealth will build an indoor track and field facility with seating for 3,000 people at Roxbury Community College. The facility will support middle and high school sports programs throughout the region.

Greater Boston Regional Profile

- Plans are underway for a 300,000 square foot building in Chelsea to house the Commonwealth's data center operations, bringing 1,200 jobs to that city.
- The Commonwealth will join with community groups, the city of Boston and the Legislature to create economic development opportunities for the 200 acre parcel of land located at the former Boston State Hospital grounds.

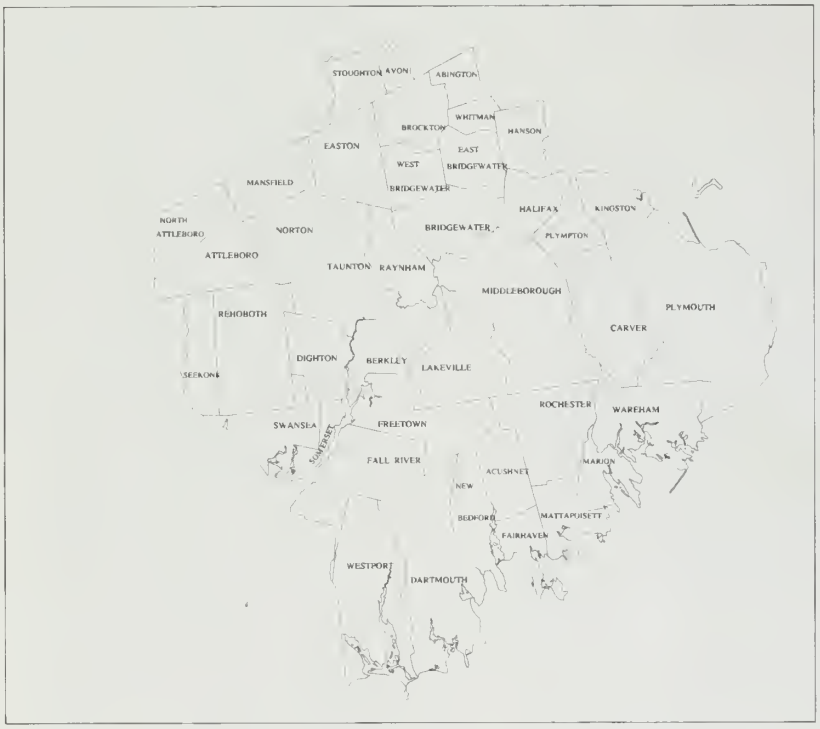
Chapter 14 Southeast Regional Profile



CHARACTERISTICS OF THE REGION

Geographic Description

The Southeast Region is defined generally by the Rhode Island border to the west, Massachusetts Bay and the Cape Cod Canal to the east, Brockton to the north and Buzzards Bay to the south. The major population centers in the region include the cities of Attleboro, Brockton, Fall River, New Bedford, and Taunton. The Southeast contains a variety of geographic features, most notably the cranberry bogs in the eastern section around Carver, the beaches in the Plymouth area and along the shores of Buzzards Bay, and the rivers and harbors along the southern coast which accommodated the growth of major fishing and factory centers in the 19th century.



Economic History and Overview

The Southeast Region has a long history of economic prominence in the state and nation. The region made its early fortunes in whaling, first at Dartmouth and later at New Bedford—which became one of the world's wealthiest cities for a brief period. As the whaling trade died out in the 1840s, manufacturing became the dominant industry. Technological innovation and investor risk-taking created centers for shoes in Brockton, and for textiles in Fall River and New Bedford. At the end of the 19th century, the latter two communities were among the nation's top 25 manufacturing cities.

The region's traditional industries since the early part of the 20th century have been textiles and apparel concentrated in Fall River and New Bedford, silver plating in Taunton, jewelry in Attleboro, and shoes in Brockton. The region began a long economic decline in the 1920s, when Massachusetts lost 94,000 jobs in textiles and shoes to the southern United States. Lower costs in terms of wages and energy were blamed for the shift, but local mill owners had ceased to be the leaders in innovation and failed to make use of new textile manufacturing technology. The Southeast's cities were dangerously dependent on these industries, with textiles employing 82 and 78 percent, respectively, of New Bedford's and Fall River's workers in 1920, and shoe manufacturing employing 81 percent of Brockton's workers. Losses continued through the Great Depression, and the region was largely bypassed by the defense industries and high technology firms that grew in eastern Massachusetts during World War II and in the decades after.

In the 1980s, strong economic growth returned to the Southeast, as improved highways and relatively low land prices brought population and businesses into the region. The region's unemployment rate fell from 9.2 percent in 1983 to 4.3 percent in 1988, reflecting 34 percent growth in retail and wholesale trade, 28 percent growth in services, and a virtual doubling of construction employment. These industries primarily served only the local population, however, and suffered in Massachusetts' economic downturn following 1988. For example, virtually all of the increase in construction employment was wiped out by 1991. See Figure 14A for further information on changes in employment by major industry from 1983-1989. The region's unemployment rate rose to nearly 12 percent in 1990, and in 1992 remained the highest of any Massachusetts region at 10.9 percent, compared to the statewide average of 8.5 percent. (See Figure 14B).

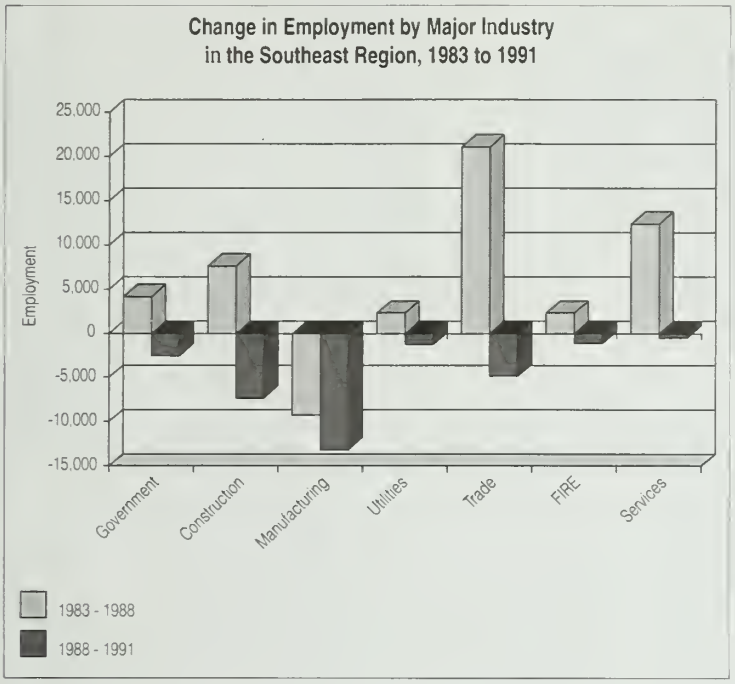


Figure 14A

The Southeast's economic base is still dominated by manufacturing, with concentrations remaining in the historic textile and shoe industries and significant electronics and jewelry production. Despite steep losses before and throughout the 1983-1991 period, manufacturing still accounts for 23 percent of all employment in the region, compared with the statewide average of 17.2 percent. Manufacturing ranges from over 50 percent of total private employment in Attleboro, 35 percent in Fall River, 33 percent in New Bedford, and 23 percent in Taunton. The region's natural resources, in terms of beaches, cranberry bogs and major ports provide employment in tourism, agriculture, and fishing. New Bedford remains the nation's largest seaport.

Many of the region's older manufacturing industries tend to produce low value-added products. In 1989, the average value added per worker-hour in the Southeast region ranged from $24 in Fall River to $31 in New Bedford and $39 in Brockton. This is far below the statewide average of $52 and the Boston average of $61. The region's industry mix also brings relatively low wages, with average payroll in the region's industries 13 percent lower than the statewide average. The prospects for the region's more mature industries depend on the extent to which firms adopt new technologies and access specialty markets here and abroad. The Southeast can also benefit from new areas of potential growth such as marine electronics and sciences.

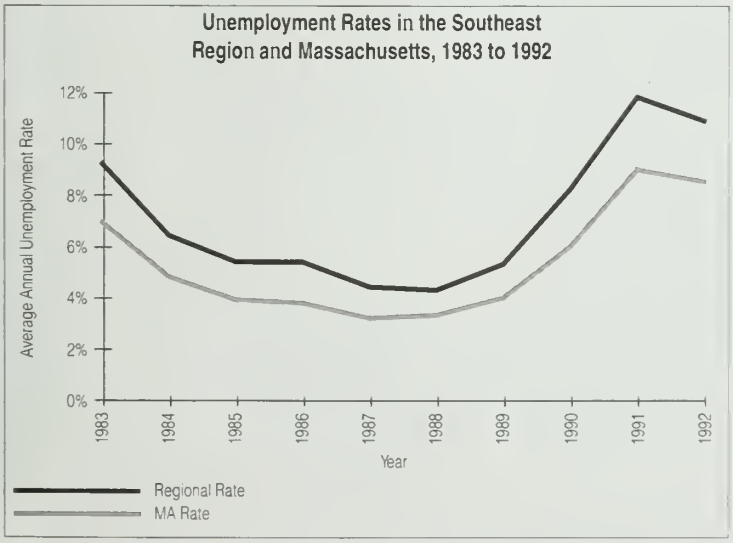


Figure 14B

The region has a large electronics and communications industry. The locating of a GTE defense communications plant in Taunton and Polaroid's medical imaging production facility in New Bedford in recent years, proves that the region's skilled manufacturing workforce, good infrastructure and relatively low costs hold appeal for advanced manufacturing firms. The region can also assist start-up technology firms emerging from the area's marine research centers, and capture more Boston-generated start-ups such as Molten Metal Technology. In the area of export services, the Southeast may be able to develop marine-oriented environmental services firms based on its research strengths.

Population Characteristics

The Southeast Region's population is 91.8 percent white, 2.4 percent Hispanics and 2.7 percent black. Population in the Southeast Region increased from 759,977 in 1980 to 817,710 in 1990, a growth rate of 7.6 percent. In comparison, population growth for the state as a whole was only 4.8 percent during the same period. Factors contributing to the region's growth were the expanded highway system, which has improved access to major employment centers both within and outside the region, and relatively inexpensive housing compared to the adjacent Boston area. While the region's major cities saw modest population increases, most of the growth occurred in smaller towns near major transportation routes. Map 3C shows the patterns of growth during the decade.

Educational attainment levels for the Southeast Region are considerably below those for the state as a whole. Less than 71 percent of the region's residents over 25 have achieved a high school diploma or the equivalent, compared to 80 percent of Massachusetts residents. Only 16.3 percent of Southeast residents have achieved a bachelor's degree or higher, which is far below the 27.2 percent statewide average. It must be noted, however, that the region's educational attainment was considerably improved during the 1980 to 1990 period, particularly in the percentage of those residents with some college education (See Figure 14C). In addition, educational attainment figures do not reflect the fact that an increasingly higher percentage of the region's high school graduates are going on

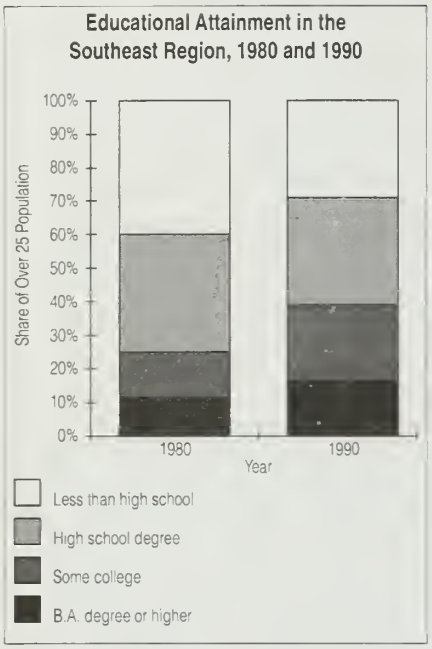


Figure 14C

to college. In Fall River, for example, 68 percent of high school graduates in 1992 went on to college.

Per capita income in the Southeast region in 1989 was $14,241, well below the statewide average of $17,224. Income growth kept pace with the state from 1979 to 1989, thus maintaining an income gap between the region and the state. In 1989, average wages per employee in the region's labor market areas varied from 74 percent to 89 percent of the statewide average. The region's economic concentration in retail trade, non-specialized services and some relatively low value-added manufacturing sectors accounts for the relatively low income. Figure 14D shows the occupational distribution of residents of the region compared with residents of the state as a whole.

Occupational Distribution in the Southeast Region & Massachusetts, 1990

	Southeast	State
Management	11.1%	14.6%
Professional	12.5%	17.4%
Technical	3.7%	4.2%
Sales	11.2%	11.4%
Clerical	16.8%	17.3%
Services	13.6%	12.8%
Farming and Forestry	1.3%	0.9%
Precision Crafts	12.7%	10.0%
Machine Operation	9.1%	5.6%
Transportation	3.7%	2.9%
Labor	4.1%	3.0%
Total	100%	100%

Figure 14D

INDUSTRY AND EMPLOYMENT TRENDS

Industry Profiles

The employment changes for the region's major industries discussed below are summarized in Figure 14E.

Textile and Apparel Industry

The Southeast Region is home to the largest concentration of textile and apparel manufacturers in the state. While the industry has undergone restructuring in recent years, the introduction of high technology production methods and the movement toward high-end niche markets should allow the industry to expand its markets and increase employment. The industry is driven by the region's skilled labor and industry-specific degree programs offered at the University of Massachusetts at Dartmouth.

The apparel and textiles industries in the Southeast Region are tied together but have different technology and cost structures, different labor needs and different future prospects. Despite job losses within the industry in recent years, Massachusetts firms are becoming more competitive in national markets. Massachusetts manufacturers must compete against foreign producers and against manufacturers in the southeastern United States who face lower labor, utility and business costs. U.S. apparel manufacturers have been especially hard-hit by foreign manufacturers with low-wage workforces. Over the past ten years, apparel imports have nearly tripled. U.S. and Massachusetts manufacturers, in particular, have been meeting the competition through the utilization of advanced production processes and product specialization.

Textiles. In 1991, there were 4,921 people employed in the production of textiles in the Southeast, representing an 11.4 percent decrease from the 1988 level of 5,557. Nearly two-thirds of textile manufacturing in the United States is for end-uses other than apparel. These vary from automobile interiors, upholstery and drapery to medical equipment, filtration devices, and felt-tip pens. Massachusetts firms, drawing from a talented pool of skilled labor, are uniquely qualified to compete through the application of advanced technologies. The most competitive textile firms are highly automated and pay considerably higher wages than the more labor-intensive apparel firms.

Textile manufacturers in the Southeast Region tend to specialize in narrow niche markets. Examples include Globe Manufacturing Company of Fall River, which produces rubber thread and spandex fiber, Bacon Felt of Taunton, which produces felt to be used in a variety of medical and industrial applications, and Albany International in Mansfield, which produces fabrics with many military and industrial applications. Massachusetts textiles manufacturers may find a new market for their material in Mexico, as the North American Free Trade Agreement (NAFTA) is expected to make Mexico a world center for apparel production.

Quaker Fabrics of Fall River is an example of a company that has made the transition to high technology design and production processes. Quaker employs nearly 1,400 people in the manufacture of textile fabrics used in furniture upholstery, car interiors and military camouflage uniforms. The company was on the brink of disaster in 1989 until it consolidated its operations into one Fall River plant and invested more than $17 million in capital improvements. In the past three years, Quaker has added nearly 200 jobs. Sales increased nearly 26 percent in 1992 to $124 million, and 15 percent of last year's sales were foreign exports.

Apparel. The Southeast's more labor-intensive, lower-paying apparel industry faces somewhat more difficult prospects. During 1988 to 1991, employment in the produc-

Southeast Regional Profile

SOUTHEAST REGION
EMPLOYMENT BY MAJOR INDUSTRY
1988 Fourth Quarter - 1991 Fourth Quarter

INDUSTRY	EMPLOYMENT CHANGE 1988-1991 FOURTH QUARTER 1988	1991	NET CHANGE	PERCENT CHANGE	PERCENT OF 1991 TOTAL EMPLOYMENT
TOTAL EMPLOYMENT	303,290	267,480	(35,810)	-11.8%	100.0%
TOTAL PRIVATE EMPLOYMENT	262,550	229,840	(32,710)	-12.5%	85.9%
AGRICULTURE, FORESTRY, & FISHING	4,240	3,710	(530)	-12.5%	1.4%
MINING	90	80	(10)	-11.1%	0.0%
CONSTRUCTION	15,660	8,200	(7,460)	-47.6%	3.1%
Special Trades Contractios	9,590	5,350	(4,240)	-44.2%	2.0%
MANUFACTURING	74,720	62,040	(12,680)	-17.0%	23.2%
Textile Mill Products	5,557	4,921	(636)	-11.4%	1.8%
Apparel & Other Textile Products	12,130	10,070	(2,060)	-17.0%	3.8%
Printing & Publishing	3,640	3,010	(630)	-17.3%	1.1%
Fabricated Metal Products	3,830	3,420	(410)	-10.7%	1.3%
Electronic & Other Electric Equiptment	11,620	10,730	(890)	-7.7%	4.0%
Miscellaneous Manufacturing Industries	7,710	6,690	(1,020)	-13.2%	2.5%
TRANSPORTATION & PUBLIC UTILITIES	12,860	11,500	(1,360)	-10.6%	4.3%
WHOLESALE TRADE	16,580	17,730	1,150	6.9%	6.6%
Wholesale Trade Durable Goods	7,460	7,800	340	4.6%	2.9%
Wholesale Trade Nondurable Goods	9,120	9,940	820	9.0%	3.7%
RETAIL TRADE	69,700	60,980	(8,720)	-12.5%	22.8%
General Merchandise Stores	7,460	6,700	(760)	-10.2%	2.5%
Food Stores	12,110	11,340	(770)	-6.4%	4.2%
Automotive Dealers & Service Stations	7,220	4,920	(2,300)	-31.9%	1.8%
Apparel & Accessory Stores	6,000	5,250	(750)	-12.5%	2.0%
Eating & Drinking Places	20,250	18,350	(1,900)	-9.4%	6.9%
Miscellaneous Retail	10,900	9,430	(1,470)	-13.5%	3.5%
FINANCE, INSURANCE & REAL ESTATE	11,660	10,240	(1,420)	-12.2%	3.8%
Depository Institutions	5,210	4,360	(850)	-16.3%	1.6%
SERVICES	57,030	55,350	(1,680)	-2.9%	20.7%
Personal Services	3,751	3,616	(135)	-3.6%	1.4%
Business Services	8,830	6,060	(2,770)	-31.4%	2.3%
Health Services	24,530	26,880	2,350	9.6%	10.0%
Social Services	4,780	4,900	120	2.5%	1.8%
GOVERNMENT	40,740	37,640	(3,100)	-7.6%	14.1%
FEDERAL	5,290	5,100	(190)	-3.6%	1.9%
STATE	8,500	7,460	(1,040)	-12.2%	2.8%
Health Services	2,082	1,390	(692)	-33.2%	0.5%
Educational Services	3,830	3,230	(600)	-15.7%	1.2%
LOCAL	26,950	25,110	(1,840)	-6.8%	9.4%
Educational Services	17,720	16,580	(1,140)	-6.4%	6.2%

SOURCE:Massachusetts Department of Employment and Training, Employment and Wages/ES-202.
NOTES:Data represent jobs covered by Unemployment Insurance laws. Data are not adjusted for non-economic changes in industry or geographic coding that may have occurred between the comparative periods.
C= CONFIDENTIAL DATA. N.E.C.= NOT ELSEWHERE CLASSIFIED.

Figure 14E

tion of apparel and other textile products in the Southeast declined from 12,130 to 10,070, a drop of 17 percent. The same NAFTA pact that may help textile firms may hurt the apparel firms, which rely more heavily on low-wage labor. While Massachusetts apparel manufacturers cannot outsell foreign competition in the market for mass-produced, low-quality apparel, some Massachusetts firms are able to compete in niche markets on the basis of high quality and style as well as shorter delivery times. These manufacturers rely on highly-skilled, rather than low-cost, labor.

Training and Research. The Textile Science Program at the University of Massachusetts at Dartmouth is the only such program in New England. The program is responsible for the training of textile chemists and engineers, and skilled workers in dyeing and finishing. Over 90 percent of program graduates are placed within New England firms. Major textile manufacturers that employ graduates of the Textile Science Program include Albany International in Mansfield and Duro Industries in Fall River. In addition, graduates are placed within many smaller niche manufacturers in the region and within the testing and research and development departments of major retail manufacturers such as Talbots and Reebok.

Despite increasingly competitive wages, long-term employment losses in apparel and textiles within the region have served to dissuade skilled labor from entering the industry. Poor marketing of opportunities within the industry has led to a shortage of students entering the fields of textile technology and chemistry. In the words of Frederick Satkin, President of Satkin Mills Inc. of New Bedford, "Our need is to publicize the fact that textile manufacturing jobs are critical to the economy of the state."

Electronics and Communications

Manufacturers of electronic and other electric equipment constituted the largest single manufacturing sector employer within the Southeast Region in 1991. Fourth quarter employment in 1991 in the industry was 10,730, representing a 7.7 percent decline from the level of 11,620 in the fourth quarter of 1988.

The largest employer in this industry is Texas Instruments, which employs approximately 4,000 people in the production of electronic control and protection devices in its Attleboro facility.

Taunton, home of GTE Government Systems Group, received the largest percentage of prime military contracts of any community in the state. With contracts valued at over $900 million in 1990, Taunton received 11.1 percent of all prime contracts statewide. GTE employs over 1,000 people in its production facilities in Taunton's Myles Standish Industrial Park. GTE is involved in the production of mobile subscriber equipment (MSE) for the Department of Defense, a form of cellular communication. GTE's military contracts of $4.2 billion are scheduled to be exhausted by December, 1993. It appears, however, that the company's commitment to the area will extend beyond the life of current military contracts. GTE has committed its Taunton facility for service and repair functions of MSE until the year 2008. In addition, the company is currently in the process of converting MSE technology for commercial uses. GTE currently contracts with area electronics firms, and may serve as the anchor for the development of a telecommunications cluster within the region.

In addition, there are approximately 47 smaller manufacturing firms in the region with an average firm size of 53 employees. Employment within the industry is most heavily concentrated in the manufacture of electronic components and accessories, electric lighting and wiring equipment and communications equipment. Electronic firms in the region are involved in a variety of manufacturing activities such as production of electric light fixtures, cable assemblies, computer circuit boards, electronic vacuum power tubes and capacitors.

Marine Science and Electronics

The Southeast and adjacent Cape Cod are home to one of the largest concentrations of marine science firms in the world. While the marine science industry currently accounts for modest levels of employment, future growth will be fueled by the existence of the region's network of research institutions such as the Woods Hole Oceanographic Institute, the marine science program at the University of Massachusetts at Dartmouth, the marine engineering program at the Massachusetts Maritime Academy, the Newport Naval Underwater Systems Center and the marine science program at the University of Rhode Island.

Included in the marine science industry in the region is marine aquaculture, marine electronics and instruments, marine and coastal environmental services and marine research and education. The largest Southeast employer in this industry is Sippican, Inc., a 400-employee manufacturer of oceanographic electronic devices based in Marion.

Marine-based electronics experienced steady growth in the late 1980s, but has since suffered a slight decline due to recessionary forces and competition from other domestic and foreign firms. Products developed and manufactured in the marine electronics industry include sonar devices, range and depth finders, offshore signal transmitters, sea bottom mapping systems and water quality instruments. Marine electronics is a high value-added industry, which translates into relatively high wages. The industry employs a higher percentage of professionals and highly-skilled workers than many other manufacturing industries. Research and development expenditures are also higher than in most other industries, comprising 7 to 10 percent of sales on average.

The U.S. Department of Defense is responsible for much of the demand for products developed in the industry. Sippican, for example, currently has prime defense contracts of nearly $13 million; accounting for nearly half the value of all prime contracts in Plymouth County. Growth in the industry, therefore, may be inhibited by expected cuts in defense spending.

In a 1990 survey, 56 marine electronics firms were identified within the Commonwealth, with approximately half of them located in the Southeast Region or on Cape Cod. Many spin-off firms have resulted from the region's network of marine science research centers described above.

The Southeast Region is poised to take advantage of its coastal location to become a center of training in maritime-related environmental remediation. Mass Maritime Academy has taken the lead by investing over $1 million in equipment to establish a computerized oil spill remediation simulator for training in environmental cleanup. In 1989, a Center for Marine Science and Technology was established at the University of Massachusetts at Dartmouth. Plans are currently underway to construct a $10 million Coastal Zone Resources Laboratory in the region. The purpose of the laboratory is to conduct research in marine ecology, coastal environmental quality and underwater communications and instrumentation. The facility is expected to generate $3 million in research funding annually.

The University of Massachusetts at Dartmouth is also the headquarters of the Northeast Regional Aquaculture Center. The center sponsors regional research and extension projects in support of the aquaculture industry in the northeastern United States.

Fishing

From Colonial days, the Southeast Region has been one of the nation's premier fishing centers. While employment in the fishing industry has declined 12.5 percent in the region from 4,240 in 1988 to 3,710 in 1991, Southeast Massachusetts is still home to major fishing fleets. Fish landings in the New Bedford port increased from 90.6 million pounds in 1985 to 114.8 million pounds in 1990; an increase of 27 percent. The port of New Bedford posts the highest value of catch of any port in the United States. The value of catch in New Bedford rose from $103.2 million in 1985 to $160.4 million in 1990; an increase of 55 percent. In addition to the fishing boats themselves, fish processing firms in New Bedford employ roughly 700 workers.

Jewelry and Silver Plating

In 1991, there were approximately 4,500 people employed in the jewelry and silver plating industry in the region. There are approximately 64 firms in the region which are part of the jewelry manufacturing industry, with an average firm size of 67 people. The largest employer in this sector is Balfour Inc. of Attleboro, which employs about 1,800 people. Balfour is a nationally recognized manufacturer of recognition jewelry and awards. Swank Inc., with facilities in Attleboro and Taunton, employs over 1,000 people in the production of men's and women's jewelry. There are approximately 40 firms in Attleboro alone which are involved in silver plating and jewelry manufacture. In nearby Taunton, Reed and Barton Silversmiths carries on a traditional craft established here in 1824.

Food Processing and Distribution

The largest employer in the food processing industry within the region is Ocean Spray Cranberries, a cooperative formed by the area's cranberry growers. The combined employment at Ocean Spray's Plymouth and Lakeville facilities is about 2,500. Ocean Spray is involved in the harvesting and processing of cranberries and the production of cranberry juice products.

The Brockton area contains a substantial concentration of supermarket headquarters, food distribution and food packaging firms. The industry includes food brokers and food processing equipment manufacturers.

Instruments and Related Products

Employment within this industry totaled 3,150 in 1991. A large percentage of this employment is concentrated in the production of medical supplies and equipment. Major employers in the industry within the region include Acufex Microsurgical Inc., a Mansfield-based 200-employee producer of arthroscopic medical instruments, Deknatel Hospital Products Group, a Fall River-based 225-employee producer of surgical instruments and supplies and Codman & Shurtleff Inc., a New Bedford based 250 employee producer of surgical and medical instruments and apparatus.

Tourism

The Southeast Region is home to many popular tourist attractions, including Plymouth Rock and the Mayflower, Plimoth Plantation, Battleship Cove and the Marine Museum in Fall River, the outlet malls in Fall River and New Bedford, the New Bedford Whaling Museum, and Horseneck State Beach in Westport. The recent closing of the Edaville Railroad was a sentimental as well as an economic loss to the Southeast. Because restaurants and shops cater both to visitors and local residents, it is difficult to quantify the size of the tourism industry.

Shoes

While most shoe manufacturing has long since left Brockton, the area still retains important links to its industrial heritage. The headquarters of three shoe companies—Foot-Joy, Etonic Tretorn, and, most notably, Reebok—remain in the area. Another 20 companies around Brockton are involved in the manufacture of shoe components such as soles and heels that are exported to other states and overseas. Employment in the Brockton area leather industry fell by 37 percent between 1988 and 1991, with only about 1,200 employees remaining.

COMPETITIVE ADVANTAGES OF THE SOUTHEAST REGION

Location and Infrastructure

The Southeast Region's extensive highway network provides excellent access to its major cities and industrial parks. The region benefits from its proximity to the two major metropolitan areas of Providence and Boston. From any point in the region, a major commercial airport, i.e. Boston's Logan Airport or T.F. Green Airport in Warwick, R.I., is within a one-hour drive. Access to Logan Airport will be further improved by the completion of the Third Harbor Tunnel, which will allow Southeast Region passengers and

Southeast Regional Profile

freight to reach Logan airport without the traffic congestion which now exists on Boston's Central Artery.

Business Costs

The region has a lower cost structure than the state as a whole in the form of lower average wages and lower land and construction costs. In 1990, average wages in the region ranged from $20,306 in the Bristol subregion to $22,685 in the South Coastal subregion, compared with the statewide average of $25,220. Within the manufacturing sector, average wages range from $23,443 in the Bristol subregion to $27,016 in the South Coastal subregion, in comparison with the statewide average of $30,926.

Salaries and wages in the region are lower than the statewide average in a number of specific professional and technical occupational categories. This may suggest that comparably skilled labor is available at lower cost in the Southeast Region.

Housing

The Southeast Region offers relatively low-cost housing compared to the Greater Boston Region. Plymouth and Bristol Counties rank sixth and eighth, respectively, in terms of median housing values within the Commonwealth's fourteen counties. Median housing values in both counties fall below that for the state as a whole.

Educational Resources and Workforce Skills

The region benefits from the presence of substantial education and research centers in Bridgewater State College, Massachusetts Maritime Academy, and the University of Massachusetts at Dartmouth. The University is responsible for industry-specific education and research relating to key regional industries such as marine science, textiles and electronics. Bridgewater State and the Southeast's two community colleges provide thousands of students with certificate and degree programs in a wide variety of fields. Together the Southeast's educational resources have the capacity to provide the specialized training area industries need to modernize and expand, but much more can be done to turn this potential into reality. The region's network of vocational schools also helps provide needed skills.

Workforce Availability

The region benefits from a large diverse pool of labor. There is a higher than average concentration of machine operators and precision crafts labor in the region than for the state as a whole, making the region's labor pool particularly suited to manufacturing industries such as textiles and electronics (See Figure 14D).

The region's key industries are undergoing constant improvements in technology and productivity, creating a need for constant skills upgrading. Together, the Southeast's educational resources have the capacity to provide the specialized training area industries need to modernize and expand.

CHALLENGES TO FUTURE GROWTH

Investment

While lending retrenchment on the part of banks is occurring statewide, the problem is severe in the Southeast Region. Centralization of bank lending decisions has led to loan approval and workouts being handled increasingly by personnel from outside the region, who are unfamiliar with local businesses.

Infrastructure

The Southeast Region is generally well-served by its infrastructure, but there are a number of infrastructure issues that could impede economic growth if not addressed:

- The region benefits from access to the Providence-Boston commuter line which has stops in Attleboro and Mansfield. However, it is currently excluded from the state's commuter rail network, making rush-hour access to Boston very difficult on highly congested roads.
- There are several key highway and bridge problems with long term economic development impacts. The middle part of the region has strong north-south highways, but currently Route 44 is a weak east-west connection. The Route 6 Fall River-Somerset and New Bedford-Fairhaven drawbridges have been hampered by mechanical failure, causing delays in both automobile and boat traffic with an economic impact on fishing and the major industrial users of the waterfront.
- There are a number of sewer and water deficiencies in the region's largest cities. Fall River is under a federal court order to improve its sewer system to comply with the federal Clean Water Act of 1977. New Bedford has plans for a new secondary sewage treatment plant that will bring it into compliance with the same Act. These improvements will come at considerable expense and could cause significant increases in water rates that will affect textile firms and other businesses in these cities. Brockton has suffered from a water supply shortage for some time. This situation puts the city under a water connection moratorium.
- Tourism is an important industry in the Southeast and the adjacent Cape and Islands region, but tourist information centers and rest areas are sorely lacking on the region's highways.

Workforce Skills and Availability

The region's key industries are undergoing constant improvements in technology and productivity, creating a need for constant skills upgrading for production and technical workers that is not being fully met. As can be seen in Figure 14D, the region's concentration of managerial, pro-

fessional, and technical labor falls below statewide averages.

Lack of Diversification

The region is more dependent on traditional manufacturing than the state as a whole, and has fewer of the export-based knowledge services that form an important economic base in other regions. This, combined with the fact that manufacturing within the region tends to be lower value-added, may perpetuate economic disparities that exist between the region and the state.

Economically Distressed Areas

Historically, the Southeast Region has fared worse than the state as a whole in terms of such economic indicators as unemployment and per capita income levels. Within the region, the urban areas of Fall River and New Bedford have displayed particularly dramatic indicators of distress. The 1992 annual unemployment rate in Fall River and New Bedford, of 13.6 and 13.3 percent, respectively, greatly exceeded the statewide rate of 8.5 percent. The percentage of people below the poverty level in Fall River and New Bedford, at 14.3 percent and 16.8 percent, respectively, also greatly exceeds the statewide level of 8.9 percent. Per capita income in these cities is only 65 percent of per capita income for the state as a whole; Figure 14F shows ranges of per capita income in the region's communities.

These two cities are also characterized by lower educational attainment. The percentage of those over the age of 25 who have achieved a high school diploma in Fall River and New Bedford is 46.7 percent and 49.7 percent respectively, compared to a statewide average of 80 percent.

Fall River and New Bedford have experienced historic patterns of disinvestment and urban blight resulting from the erosion of such base industries as apparel and textile manufacturing. The labor forces of both cities are particularly hindered in their ability to make the transition towards high-skill, high value-added occupations.

REGIONAL POLICY PRIORITIES

Investment

The Southeast Region has taken steps to deal with the lack of long and short-term investment resources for area businesses, most notably the non-profit SEED Corporation.

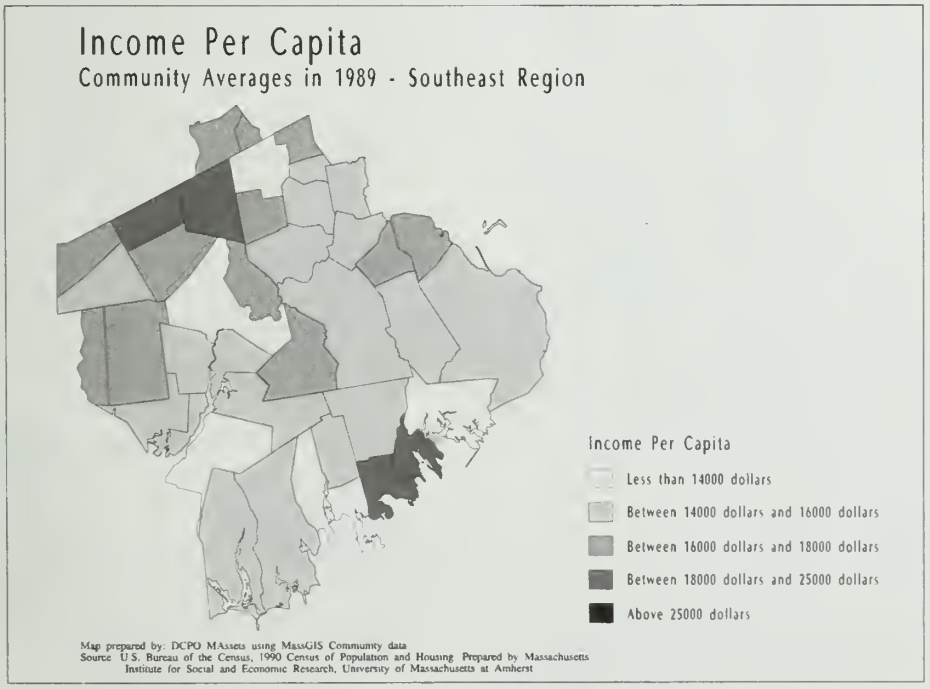

Income Per Capita
Community Averages in 1989 - Southeast Region
Income Per Capita
Less than 14000 dollars
Between 14000 dollars and 16000 dollars
Between 16000 dollars and 18000 dollars
Between 18000 dollars and 25000 dollars
Above 25000 dollars
Map prepared by: DCPO MAssets using MassGIS Community data
Source U.S. Bureau of the Census, 1990 Census of Population and Housing Prepared by Massachusetts Institute for Social and Economic Research, University of Massachusetts at Amherst

Figure 14F

The region's cities are also involved in lending assistance. For example, the Fall River Office of Economic Development's loan program has leveraged over $150 million in private investment. The state and its quasi-public agencies have provided funds and technical assistance to companies in the region, but the state's principal role should be to stimulate investment by the private sector. Several of the programs described in this *Strategy* address these issues:

- A phased capital gains tax reduction and a new venture fund tied to the state's pension fund would help address the patient capital and early stage equity investment needed by the region to develop new technology-based companies.
- An increased investment tax credit would have a major impact on helping Southeast firms to make the investment in new plant and equipment they need to remain competitive, particularly in mature industries such as textiles and apparel.
- Targeted efforts such as the Small Business Capital Access Program are needed to encourage bank lending to existing Southeast firms for working capital.

Education

The Southeast's heavy reliance on manufacturing and other industries not requiring college degrees means that its economy is particularly dependent on quality K-12 education and effective vocational technical schools. The vocational system in New Bedford has fashioned effective programs that should be adopted in other communities.

The quality of public higher education is also of special importance in the Southeast Region. In the 1990-1991 academic year, 88 percent of the 27,000 college students in the Southeast Region were at public institutions, compared to a statewide average of about 50 percent. About 70 percent of college-bound high school seniors from the region's largest cities go on to public institutions.

The state has a major role to play in the region's educational system. Several of the

programs described in this *Strategy* address these issues:

- Reform of K-12 education will ensure that the region's poorer communities are able to provide adequate funding to their school systems, will create effective curricula based on statewide achievement standards, and will eliminate barriers to educational excellence such as a lack of professional development opportunities for teachers.
- The planned Old Colony Center for Technological Applications at Bridgewater State College will apply the latest advances in educational technology model programs that will enhance teaching and learning in the public schools, particularly in math and science.
- The state college and university campuses are moving toward specialized curricula that will more effectively educate students for jobs in the Southeast Region's key industries. The University of Massachusetts at Dartmouth and Bridgewater State College already provide the region's key industries with managerial, technical and research talent through programs in electronics, computer science, and textile and marine sciences.

Training

The region is in need of more industry-specific training programs. The region's current and emerging industries are particularly in need of skilled production labor. For example, the textile industry has undergone restructuring and unprecedented levels of new investment in production technologies in recent years, creating a critical need for worker retraining. Several of the programs described in this *Strategy* address these issues:

- The MassJobs Council is working with the Southeast's Regional Employment Boards to define specific training needs of the region's critical existing and emerging industries.
- The Commonwealth is creating a worker training system driven by the needs of the region's industries such as textiles and electronics. Firms should work closely with educational institutions, such as the region's two community colleges, to create effective training programs.

Scallop fishermen unload their catch in New Bedford, the United States' largest commercial fishing port. Building on a long seafaring tradition, the Southeast is also a leader in marine sciences and electronics.

Know How and Industrial Modernization

Many of the region's firms in such industries as marine science, electronics, and jewelry are small, with less than 50 employees. These firms simply lack the staff and resources to investigate "best practices" in management and production technologies, which could help them compete against lower-cost regions. Several of the programs described in this *Strategy* address these issues:

- An Industrial Extension Service could unite current disjointed programs and focus their resources on small- and medium-sized manufacturers in the region. Services provided could include identification of proven process technologies and methods, and ties to training, research programs, financial and regulatory assistance programs, and export programs.

Infrastructure

The Southeast Region and its communities have made substantial progress in addressing their major infrastructure and land-use needs, setting up industrial parks and investing in various public sewer works. New Bedford has plans for a new secondary sewage treatment plant that will bring it into compliance with the federal Clean Water Act of 1977. Brockton has been dealing with its water supply shortage by gaining "water credits" through leak detection and repairs. The state also has an important role to play in addressing some of the region's important infrastructure issues:

- The Southeast will soon be served by the MBTA's restoration of the Old Colony Railroad, which was discontinued in the late 1950s. Two of the three restored lines will provide service to the region, terminating in Lakeville and Plymouth.
- Reconstruction of Route 44 from Plymouth to Raynham in 1997 will improve the key east-west connection between Plymouth, Taunton, and Providence. Replacement of the Brightman Street Bridge in 1997 will ensure that both road traffic and shipping can flow smoothly.
- The state currently is working with the city of Brockton to develop a long-term solution to its water shortage problem and avoid what could be an impediment to economic development.
- An Economic Development Capital Program could be used to finance major state capital projects which will create or improve upon the region's competitive advantages. An example is the Coastal

Zone Research Laboratory, which would strengthen the region's competitive advantage in marine research.

- There is potential in the Southeast for the expansion of the tourism industry through improvements in tourism infrastructure. The state should work to provide adequate information centers and rest areas along major highways in the region. There is a particular need for such centers along Interstate 195, which carries traffic through the region to Cape Cod.

Regulatory Environment

The Southeast's heavy dependence on manufacturing means that it faces commensurate problems in complying with environmental regulations. Manufacturers are also particularly affected by cost factors such as workers' compensation and energy. Finally, the region would benefit from the reuse of older industrial facilities, but is hampered by hazardous waste problems. Several of the programs described in this *Strategy* address these issues:

- Technical support from the Commonwealth's toxic use reduction and energy advisory services can facilitate adoption of new production methods and technologies that make environmental compliance easier and energy costs lower.
- The state will continue to work hard to minimize increases in workers' compensation, unemployment insurance, and other related business costs that can hurt competitiveness.
- Reform of Chapter 21E of the General Laws, which regulates hazardous waste at industrial sites, is being implemented to make reuse of older sites easier.

Technology Transfer

The Southeast Region's industries will be driven by the ability of its universities and research centers to develop technology from the idea stage to productive implementation. This includes the development of new products as well as production methods. The region's marine science and electronics industries may be faced with the need to convert production from defense-related products to commercial products. Several of the programs described in this *Strategy* address these issues:

- The state and the state university system can help create technology partnerships to link large and small companies, universities, and research laboratories. Partnerships could publicize technology breakthroughs and the availability of financial assistance, create collaborations between firms and researchers, and help bring federal grants to the region.
- The University of Massachusetts at Dartmouth currently aids the region's key industries through its programs in marine sciences, textiles and other physical sciences. The University should strengthen its technology transfer and commercialization capabilities.
- The region's marine science industry will benefit from the development of the Coastal Zone Resources Laboratory, which will conduct research in marine ecology and underwater instrumentation.

Export Promotion

Support is also needed to promote exports. For example, while foreign competition is winning lower-end apparel markets, Southeast firms may be able to gain market share in foreign markets for high technology niche products. The Southeast Massachusetts Partnership offers export assistance to the region's industries and has conducted trade missions to market the region. The Northern Textile Association, a Boston-based trade association of textile manufacturers, has recently established the Northern Textile Export Trading Company. This entity will act on behalf of member firms to negotiate in joint bidding and selling, establish export prices for sales of products and engage in joint promotional activities. Several of the programs described in this *Strategy* address the state's role in these issues:

- Companies trying to enter foreign markets today generally find it difficult to obtain bank financing to fill orders originating in foreign countries. The state should support export guarantees to address the loan risk problem directly.
- The Massachusetts Office of International Trade and Investment provides Massachusetts companies with a host of programs, services and institutional functions that support and facilitate foreign market expansion.
- The state's trade missions have been extremely successful in raising awareness of export opportunities and in helping individual companies access foreign officials in order to negotiate a contract or penetrate a market.

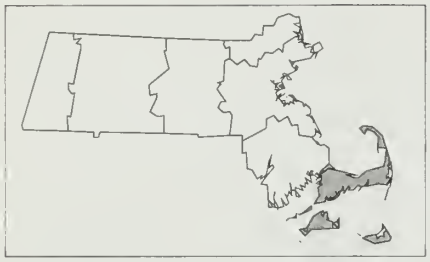
Economically Distressed Areas

The Commonwealth is committed to a more equitable distribution of economic opportunities. Economic distress leads to despair, hopelessness and criminal activity. As an investment decision, the creation of jobs in distressed urban areas within the Southeast Region promises great returns. The movement of individuals from public assistance to the workforce both increases the wealth of the state, and decreases the drain on public resources.

There is great potential within the Southeast Region's distressed areas to tap into resources such as existing infrastructure and developable mill sites. The Commonwealth is currently involved in several efforts to alleviate disinvestment in distressed areas:

- The proposed Economic Opportunity Areas would encourage investment in the region's urban areas through a combination of tax incentives, regulatory relief, and financing tools to facilitate infrastructure development.
- Several state programs exist which target private investment to distressed areas, including a Venture Capital Fund and Small Loan Guarantee Program administered by the Community Development Finance Corporation.

Chapter 15 Cape & Islands Regional Profile



CHARACTERISTICS OF THE REGION

Geographic Description

The Cape and Islands Region consists of Barnstable, Dukes and Nantucket Counties. Cape Cod and the islands of Martha's Vineyard and Nantucket are made up of 23 towns, the largest of which is Barnstable. The region is bordered by the Cape Cod Canal to the West, Cape Cod Bay to the north and Nantucket Sound to the south. The town of Barnstable, which includes the village of Hyannis, is approximately 70 miles from Boston and 225 miles from New York. The islands of Martha's Vineyard and Nantucket lie approximately seven miles and 20 miles offshore in Nantucket Sound. The region's unique geographic characteristics set it apart from the state as a whole. A substantial percentage of the region's land area is made up of barrier beaches and fragile inland and coastal wetlands. These areas are also home to a diverse mix of wildlife and plant habitats. The Cape and Islands Region is very much dependent upon the survival of its natural resources in maintaining its tourism and its resource-dependent industries such as shellfishing.

Economic Overview

The Cape and Islands regional economy is unique in Massachusetts for its strong dependence on income generated elsewhere and brought to the region by tourists and other visitors, retirees, second-home owners, and Cape Cod residents working in other parts of eastern Massachusetts. Indigenous base industries are limited to a small amount of manufacturing and export services, a few important research institutions, and fishing and agriculture. This unusual economic base presents two major problems for the region:

- The region's economic vitality is heavily seasonal, and is subject to the vagaries of weather, vacation trends, and the economic prosperity of the rest of Massachusetts and the northeastern states. Unemployment rates jump several points between summer and winter, and, from year to year, employment is extremely sensitive to the economic fortunes of areas and industries outside the region's control. Dependence on visitors and retirees is especially deep on the Islands.
- The Cape and Islands have been able to grow and thrive because of their attractiveness as places to live and visit, but this same growth is threatening to undermine the attractiveness and environmental quality the region depends upon. This is a particular problem on Cape Cod, where commercial development on Route 28 and elsewhere has brought traffic jams and visual blight that threatens the area's attractiveness.

The Cape and Islands are attempting to remedy these problems by developing a more diversified economic base that builds upon the energies and talents of local residents, while simultaneously working to mitigate the conflicts between economic development and preservation of the region's fragile environment and cultural charm.

Emerging Industries. The region currently benefits from a highly educated workforce, which has the potential to drive growth in innovation-dependent emerging industries such as marine electronics, environmental science, and software design. The movement of labor toward these industries will be dependent upon the region's ability to direct technology transfer from its research centers to new companies nearby.

Cape & Islands Regional Profile

Cape Cod. The Cape has better prospects than the Islands in building a diversified economy, but it may also face greater threats to its environment and character. The Cape Cod Commission has been path-breaking in its attempts to accommodate economic growth within the Cape without compromising its natural resources. The Commission, established in 1990, is charged with developing long-term, regionwide land use planning and economic development strategies for Cape Cod. It represents an experiment in coordinated state, regional, and local level regulatory permitting. A major benefit of this experiment has been the creation of consistent regional regulatory priorities for the Cape.

Martha's Vineyard and Nantucket. The Islands have several disadvantages in diversifying their economies, including difficult transportation access, small labor forces with limited educational options, and high costs. The isolation that makes the Islands compelling places to visit makes them difficult places to locate businesses. Advances in communications offer the potential to resolve some of these problems. The Martha's Vineyard Commission and Nantucket Planning Commission have long worked to preserve the Island's fragile environments, and can play a larger role in encouraging economic diversification and growth.

Population Characteristics

Population in the Cape and Islands Region grew rapidly from 161,254 in 1980 to 204,256 in 1990; a 26 percent increase. In 1990, the region's population was 95 percent white, 1.7 percent black and 1.1 percent Hispanic. Martha's Vineyard (Dukes County) registered population growth of 30 percent during the period, while Cape Cod (Barnstable County) grew at a rate of 26 percent and Nantucket by 18 percent. The Commonwealth's growth rate during the same period was less than 5 percent. Much of this population growth can be attributed to the attractiveness of the region to retirees in an increasingly aging society, proximity to employment centers in the Southeast Region and Greater Boston's South Shore, and median housing values which lay below state averages. The Cape Cod population is estimated to triple during the summer months, exceeding 500,000 with the influx of summer residents and visitors.

Barnstable County's per capita income in 1989 was $16,402, compared with the statewide level of $17,224. Meanwhile, Dukes and Nantucket Counties' per capita income exceeded the statewide level, at $18,280 and $20,591, respectively. When the high cost of living of the Islands is considered, however, the purchasing power of this income is considerably eroded. Figure 15A illustrates the range of income by town in the region.

The region's population is more highly educated than that of the state as a whole. In Massachusetts 80 percent of those over the age of 25 have received a high school diploma or equivalent, while 27.2 percent have received a bachelors degree. In Barnstable County, 88.4 percent of those over the age of 25 have received a high school diploma or equivalent, while 28.1 percent have received a bachelor's degree. In Dukes County the levels are 90.4 percent and 32.1 percent respectively; while the Nantucket County levels are 89.4 percent and 32.9 percent respectively. These above-average educational attainment levels can be explained partly by the Cape and Island Region's large population of well-educated, affluent retirees. Figure 15B shows a breakdown of educational attainment levels in the region.

The expansion of the region's population and a thriving second home market fueled a

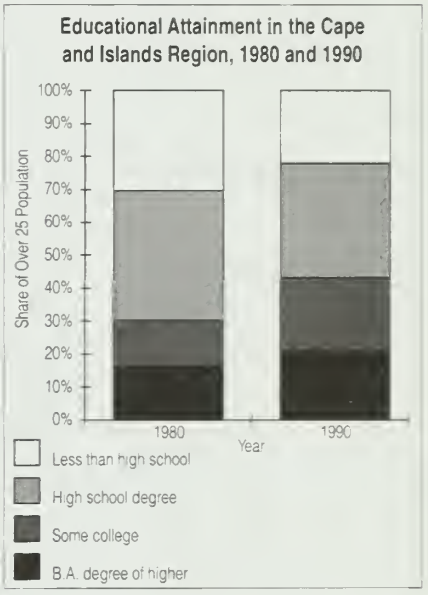


Figure 15B

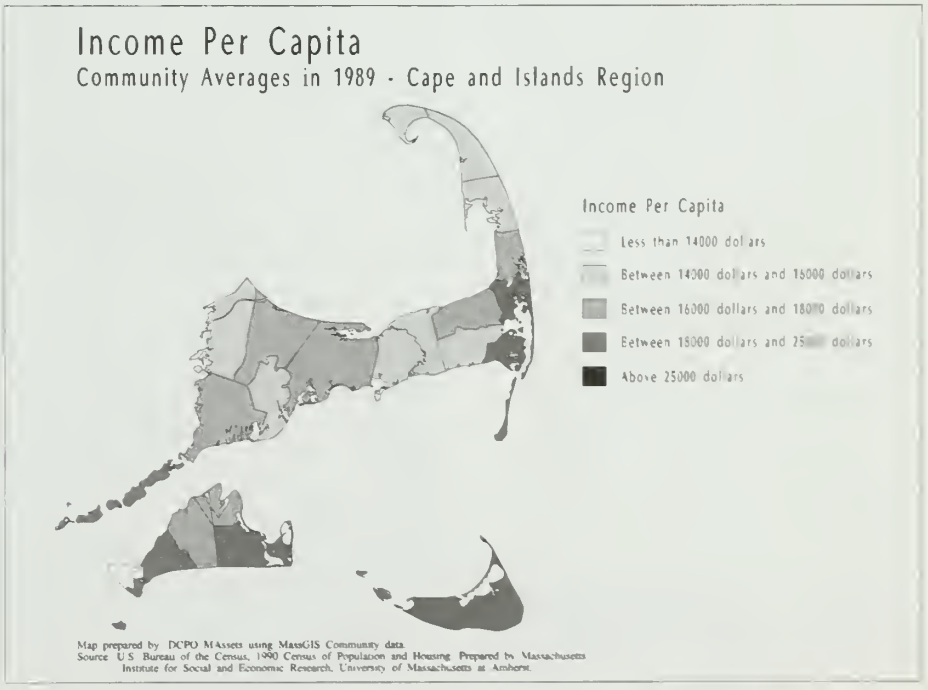

Income Per Capita
Community Averages in 1989 - Cape and Islands Region
Income Per Capita
Less than 14000 dollars
Between 14000 dollars and 16000 dollars
Between 16000 dollars and 18000 dollars
Between 18000 dollars and 25000 dollars
Above 25000 dollars
Map prepared by DCPO MAssets using MassGIS Community data.
Source U.S. Bureau of the Census, 1990 Census of Population and Housing. Prepared by Massachusetts Institute for Social and Economic Research, University of Massachusetts at Amherst.

Figure 15A

major boom in housing construction. Between 1980 and 1990, Nantucket led the state in the production of new housing, with a 47 percent growth rate. Immediately following was Barnstable County, which experienced an addition of 35,246 new housing units between 1980 and 1990, representing a 35 percent gain.

The 1991 median housing value in Barnstable County, at $123,500, is 6 percent less than the statewide level of $131,323. On the other hand, Dukes County's median housing value of $165,000, was the second highest of all Massachusetts counties.

INDUSTRY AND EMPLOYMENT TRENDS

Recent Developments

The Cape and Islands regional economy centers on serving the needs of tourists, retirees and second home owners. Its fortunes are tied to the health of the economy of the entire northeastern United States. Job growth between 1980 and 1988 was 37 percent. Much of this job gain, however, was in industries such as construction, which suffered when the northeast states slid into recession.

Between the fourth quarter of 1988 and the fourth quarter of 1991, total employment in the Cape and Islands Region fell by 9.7 percent, representing a net loss of 7,760 jobs. These substantial job losses can be attributed to the post-1988 collapse of the commercial and residential construction boom in the region. The largest losses occurred in construction and retail trade, with net job losses of 2,810 and 3,720, respectively. The only significant gains were in health services and engineering and management services, which posted gains of 14.4 percent and 10.9 percent, respectively. Figure 15C illustrates employment changes within the region's major industry sectors.

Average unemployment in 1992 in the region was 10 percent, exceeding the statewide rate of 8.5 percent. Provincetown and Truro have the highest unemployment levels in the state,

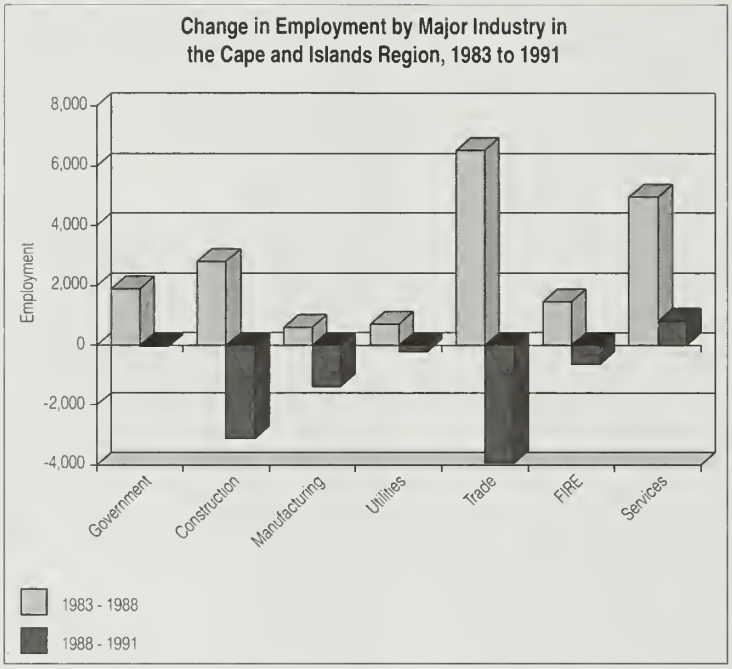


Figure 15C

with 1992 average unemployment rates of 28.4 percent and 20.9 percent, respectively. As can be seen in Figure 15D, unemployment within the region has exceeded state levels between 1983 and 1992.

Critical Industries

An industry profile of the Cape and Islands must break the bounds of conventional analysis. A look at the structure of the region's economy (see Figure 15E) reveals that there is very little employment in what are normally considered "base" industries; industries that bring income into a region and support "local" industries such as construction and retail stores. Manufacturing, for example, employed only 4.4 percent of the region's workforce in the fourth quarter of 1991. Retail trade accounted for 31.2 percent of all jobs, compared to a statewide average of 17.4 percent, and would employ an even larger share in the summer months.

The region can sustain itself on largely "local" industries because it imports people and the money they earn or earned elsewhere. A 1987 study developed by the Charles River Associates estimated that the income of Barnstable County in 1985 was derived from retirees (27 percent), tourists (26 percent), seasonal residents (22 percent), manufacturing (10 percent), and miscellaneous business sources (15 percent).

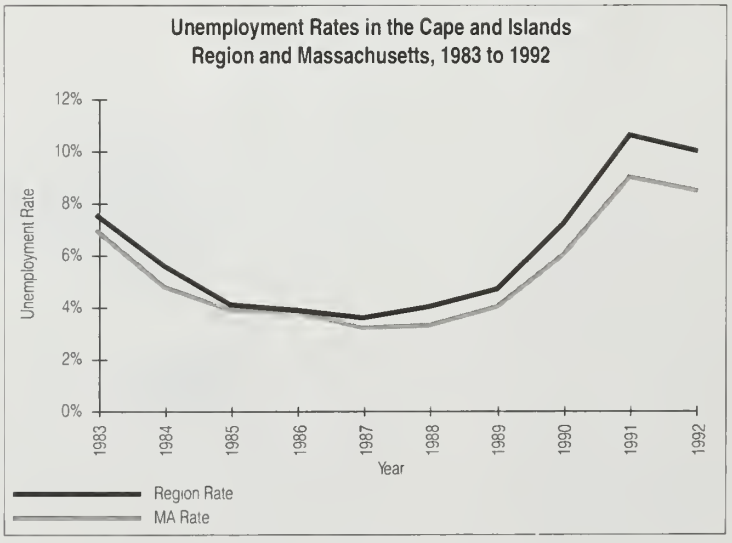


Figure 15D

The Martha's Vineyard and Nantucket economies are almost completely reliant upon tourism and services for seasonal residents and retirees. A 1985 study of the Martha's Vineyard economy estimated that 95 percent

CAPE AND ISLANDS REGION
EMPLOYMENT BY MAJOR INDUSTRY
1988 Fourth Quarter - 1991 Fourth Quarter

INDUSTRY	EMPLOYMENT CHANGE 1988-1991 FOURTH QUARTER 1988	1991	PERCENT CHANGE	NET CHANGE	PERCENT OF 1991 TOTAL EMPLOYMENT
TOTAL EMPLOYMENT	80,230	72,470	-9.7%	(7,760)	100.0%
TOTAL PRIVATE EMPLOYMENT	68,860	60,040	-12.8%	(8,820)	82.8%
AGRICULTURE, FORESTRY, & FISHING	1,410	1,300	-7.8%	(110)	1.8%
Agricultural Services (includes Landscaping Services	1,110	960	-13.5%	(150)	1.3%
CONSTRUCTION	5,910	3,100	-47.5%	(2,810)	4.3%
General Buliding Contractors	2,360	980	-58.5%	(1,380)	1.4%
Special Trade Contractors	3,160	3,100	-1.9%	(60)	4.3%
MANUFACTURING	4,610	3,210	-30.4%	(1,400)	4.4%
Printing & Publishing	1,230	1,000	-18.7%	(230)	1.4%
TRANSPORTATION & PUBLIC UTILITIES	4,030	3,770	-6.5%	(260)	5.2%
WHOLESALE TRADE	1,740	1,590	-8.6%	(150)	2.2%
Wholesale Trade Durable Goods	1,060	950	-10.4%	(110)	1.3%
RETAIL TRADE	26,300	22,580	-14.1%	(3,720)	31.2%
Building Materials & Garden Supplies	1,780	1,060	-40.4%	(720)	1.5%
General Merchandise Stores	1,720	1,470	-14.5%	(250)	2.0%
Food Stores	4,300	4,090	-4.9%	(210)	5.6%
Automotive Dealers & Service Stations	2,170	1,630	-24.9%	(540)	2.2%
Apparel & Accessory Stores	1,890	1,540	-18.5%	(350)	2.1%
Eating & Drinking Places	8,950	8,290	-7.4%	(660)	11.4%
Miscellaneous Retail	4,590	3,810	-17.0%	(780)	5.3%
FINANCE, INSURANCE & REAL ESTATE	4,320	3,730	-13.7%	(590)	5.1%
Depository Institutions	1,960	1,590	-18.9%	(370)	2.2%
Real Estate	1,360	1,210	-11.0%	(150)	1.7%
SERVICES	20,510	21,720	5.9%	1,210	30.0%
Hotels & Other Lodging Places	3,530	3,270	-7.4%	(260)	4.5%
Personal Services	870	900	3.4%	30	1.2%
Business Services	1,370	1,440	5.1%	70	2.0%
Health Services	6,950	7,950	14.4%	1,000	11.0%
Social Services	1,540	1,550	0.6%	10	2.1%
Engineering & Management Services	2,290	2,540	10.9%	250	3.5%
GOVERNMENT	11,370	11,430	0.5%	60	15.8%
FEDERAL	1,790	1,650	-7.8%	(140)	2.3%
STATE	1,080	1,010	-6.5%	(70)	1.4%
Health Services	140	130	-7.1%	(10)	0.2%
Educational Services	360	310	-13.9%	(50)	0.4%
LOCAL	8,500	8,770	3.2%	270	12.1%
Health Services	180	170	-5.6%	(10)	0.2%
Educational Services	4,150	4,490	8.2%	340	6.2%

SOURCE: Massachusetts Department of Employment and Training, Employment and Wages/ES-202.

NOTES:Data represent jobs covered by Unemployment Insurance laws. Data are not adjusted for non-economic changes in industry or geographic coding that may have occurred between the comparative periods. C= Confidential data.

Figure 15E

of the area's base economy is related either directly or indirectly to the resort industry, vacation services and sales, and second home construction and attendant services. Manufacturing is negligible on the islands, but there are substantial fishing and shellfishing industries.

Industry Profiles

Tourism

Tourism is the Cape and Islands Region's most significant "export" industry: the region generates much of its income through a massive influx of vacationers and people making day trips. In addition to many miles of beaches, popular attractions in the region include the Pilgrim Memorial Museum and Monument in Provincetown, the many small theater companies throughout the Cape and the variety of shopping districts in Provincetown, Orleans, Hyannis, Oak Bluffs, Nantucket and other towns. The Cape Cod National Seashore estimated 5.3 million visits to its sites in 1991, a 4 percent increase over 1990 levels.

The Cape and Islands Region has an obvious competitive advantage in terms of natural beauty and resources, which translates into a far greater reliance on tourism-related industries than the Commonwealth as a whole. There were 288 hotel and motel establishments in Barnstable County in 1987, representing nearly 31 percent of the state total.

One measure of the extent of the scope of tourism-related activities is an examination of retail sales in the region. The Census Bureau analysis of 1982 retail sales ranked Barnstable County 20th among the nation's 3,139 counties in both retail sales per capita and per capita sales in eating and drinking places. Eating and drinking places were the top employers in the region in 1991, accounting for 11.4 percent of total employment compared to the statewide average of 5.7 percent.

Efforts are being made to transform the region's tourism-related industries from dependence on seasonal activities to a more diversified mix of year-round activities. Possible examples include the Woods Hole Oceanographic Institution's proposed Ocean Discovery Science Center, and expansion of museums and cultural events. The Ocean Discovery Science Center would act as an educational resource for the region. The museum will provide information concerning marine life through the use of interactive exhibits. The Commonwealth has provided Woods Hole with a grant to conduct a feasibility study for the Center.

There is growing concern that Cape Cod's environmental quality and historic charm is eroding. The growth of tourism has led to traffic jams, unsightly commercial development, and wastewater problems that threaten to undermine the very reasons for visiting the area. Efforts to encourage visitors to use public transportation, which has been very successful on Martha's Vineyard, is one way to help mitigate the effects of tourism on the region.

Retirees, Second Home Owners, and Commuters

Many of the same amenities that bring vacationers to the area have brought many thousands of part or full-time residents who pump money earned elsewhere into the region's retail, services, construction and real estate industries. The retired population is especially important on Cape Cod, as illustrated by the 31 percent of Barnstable County's income that comes from Social Security or private retirement income. Twenty-two percent of Cape Cod residents in 1990 were 65 years or older, compared to the statewide average of 13.6 percent. Martha's Vineyard's over-65 population was just over the statewide average at 15.7 percent and Nantucket's was equal to the statewide average at 13.6 percent. Retirees are especially prominent in Lower Cape communities such as Chatham, Orleans, and Harwich.

Other important income sources include second home owners and commuters. A large number of Cape Cod residents, mostly in Upper Cape communities such as Sandwich and Bourne, commute to jobs outside the region and bring much of their income back to the local economy. Second home construction, sales and maintenance was a particularly large part of the region's economy in the 1980s, and when in residence the owners buy groceries, hardware, and other supplies in local establishments.

Health Services

The health services industry experienced a 14.4 percent increase in employment between the fourth quarter of 1988 and the fourth quarter of 1991, and is the second largest employer in the region. Growth in this industry can be attributed to population increases over the past decade. In particular, the high percentage of residents in the region above the age of 65 has led to increased demand for health services.

The health services industry must continue to expand its range of services if the Cape and Islands Region is to continue to serve and attract a substantial retiree population. The region is likely to expand home health care and hospital services. Maintaining hospital services on the Islands is essential to their ability to attract and retain residents and visitors alike. In addition, the health care service industry can be strengthened through the expansion of the supplier base of the health care industry, including medical laboratories and medical equipment and supplies.

Marine Science

Included in the marine science industry in the region is aquaculture, marine-related electronics and instruments, marine and coastal environmental services, and marine research and education.

The Woods Hole Oceanographic Institution and the Marine Biological Laboratory serve as the engines which drive innovation in the marine science industry in the region. Each year, the Institution attracts over $65 million in research grants from such sources as the National Science Foundation and the Office of Naval Research. Nearly 1,500 people work at local scientific institutions and at over 20 spin-off marine research and marine electronics firms in the Woods Hole area. Additional research centers in the region include the Nantucket Research and

Education Foundation and the Nantucket Marine Lab. This concentration of world-renowned research and development centers has remarkable potential for growth in the fields of marine science, neurology (related to marine life) and biotechnology.

Marine-based electronics experienced steady growth in the late 1980s, but has since suffered a slight decline due to the recession and competition from other domestic and foreign firms. Products developed and manufactured in the marine electronics industry include sonar devices, range and depth finders, offshore signal transmitters, sea bottom mapping systems, and water quality instruments. Marine electronics is a high value-added industry which provides relatively high wages. The industry employs a higher percentage of professionals and highly-skilled workers than many other manufacturing industries. Research and development expenditures are also higher than in most other industries, comprising 7 to 10 percent of sales, on average. Manufacturers of oceanographic equipment and instruments within the region include EG&G Inc./Ocean Products and Data Sonics Inc in Cataumet and Benthos Inc. of North Falmouth.

Fishing

It is estimated that over 1,000 people are employed in the fishing and shellfishing industry within the region. The volume of fish landings on the Cape alone has declined by nearly four million pounds between 1984 and 1990. This decrease is attributed to the over-fishing which occurred in the past decade and to a natural decline in the stock of fish. The most active fishing ports in the region are Provincetown, Chatham, Wellfleet, Sandwich, Menemsha, and Nantucket.

It is hoped that development of managed aquaculture will help to alleviate the recent declines in the harvest of shellfish. Hundreds of acres are now under cultivation for quahogs, oysters, and scallops on the Cape and Nantucket. The shellfishing industry has been hurt by the rise in acreage closed to shellfishing from 712 acres in 1980 to 7,516 in 1989. The closing of shellfish beds is due mainly to degraded water quality and more stringent environmental regulations. The Cape Cod quahog harvest declined from 90,000 bushels in 1970 to 42,000 bushels in 1988.

Environmental Services

Due to the demands made on its fragile ecology, the Cape and Islands Region is uniquely poised to become a center for innovation in environmental technology. Environmental business services is cited by the Regional Employment Board as an emerging industry in the region because of current environmental trends, federal and state requirements, and the region's emphasis on environmental activities. While employment in the industry is currently small, environmental constraints will stimulate growth in water pollution control, waste management and related consulting services. Engineering and management services, which includes environmental services, was one of the few sectors in which employment increased during the 1988 to 1991 period.

One particular emphasis for innovation is expected to be technologies for on-site wastewater disposal systems. The denitrification problem is especially acute on Cape Cod, and will drive initiatives to develop backyard systems to meet increasingly stringent standards.

Software Development & Other Industries

The region's highly-educated workforce and high quality of life may fuel growth in high technology industries such as software development. The region is home to a growing number of high technology firms including Software 2000, a Hyannis-based employer of over 200 which develops business software.

COMPETITIVE ADVANTAGES OF THE CAPE & ISLANDS REGION

Location and Infrastructure

The Cape and Islands' tourism and retirement economy has prospered largely because of the region's favorable location. The surrounding ocean ensures a mild climate relative to most of New England; cooler in the summer and warmer in winter. The geography of the peninsula and islands has kept the region relatively remote, yet it lies within close proximity to major population centers. Providence and Boston are within 50 and 80 miles, respectively, from the centers of Falmouth, Hyannis, and Orleans. Regular commercial air service from Barnstable Airport links Hyannis to Boston, New York, Newark, Nantucket and Martha's Vineyard. The Islands have year-round, non-stop service to Boston, Hyannis, and New Bedford, and summer service to New York.

Freight service is available through the Old Colony Railroad, which serves routes on the Cape as far as Falmouth and South Dennis.

Education

In the area of higher education, the Cape benefits from the varied curricula at Cape Cod Community College and the specialized programs at the Massachusetts Maritime Academy and Woods Hole Oceanographic Institution. The Maritime Academy is moving aggressively to expand its offerings, including a new program in environmental remediation. Woods Hole's graduate program in marine sciences, run in conjunction with MIT, brings many talented students to the region who sometimes stay on to found local companies.

Workforce Skills and Availability

Educational attainment levels in all three counties within the region exceed the statewide average. The region's pool of educated labor and its attractive quality of life could support future growth in high technology, innovation-driven emerging industries such as environmental services and software design. As can be seen in Figure 15F, the region's concentration of management, professional, and technical labor has grown substantially between 1980 and 1990.

Quality of Life

The Cape and Islands Region benefits from its physical beauty and abundance of natural

Occupational Distribution in the Cape and Islands Region & Massachusetts, 1990

	Cape	State
Management	13.1%	14.6%
Professional	14.9%	17.4%
Technical	2.9%	4.2%
Sales	15.1%	11.4%
Clerical	13.8%	17.3%
Services	15.2%	12.8%
Farming and Forestry	2.9%	0.9%
Precision Crafts	13.1%	10.0%
Machine Operation	2.5%	5.6%
Transportation	3.4%	2.9%
Labor	3.0%	3.0%
Total	100%	100%

Figure 15E

resources. The region boasts over 600 miles of coastal land, which affords extraordinary recreational opportunities including boating, swimming, and fishing. The region has an obvious competitive advantage in terms of tourism and attractiveness to retirees.

CHALLENGES TO FUTURE GROWTH

Location and Infrastructure

While the remoteness of the Islands and the outer Cape is a benefit in terms of attracting tourists, it serves as a hindrance in attracting non tourism-related business activity.

The region is underserved by public transportation in the forms of bus and rail service. Bus service within the region is limited, while passenger rail service to the region is virtually nonexistent. Amtrak provides weekend passenger service from New York to Hyannis during the summer months, but no direct service from Boston currently exists. The lack of passenger rail service and better public transit within the region encourages residents and visitors to use personal cars to reach the Cape, creating severe traffic congestion during the summer months.

Infrastructure related to tourism is inadequate in the region. Rest areas and tourist information centers are insufficient at the main highway entrances to the Cape and along Routes 6 and 28.

Investment

While the credit crunch has made it difficult for firms to obtain bank financing across the state, the Cape and Islands Region faces particular difficulties due to its dependence on small businesses and people who are self-employed. The percentage of Cape and Islands region firms with 4 or less employees is 63.3 percent, compared to statewide level of 52.6 percent. These ventures find it inherently difficult to obtain bank financing. In addition, businesses involved in seasonal trade are considered to be higher risk by banks concerned with their volatile cash flows.

Educational Resources

Population growth within the region has led to increased demands on the primary and secondary school systems. A few Upper Cape towns are struggling with overflow classes and severely inadequate facilities. In the area of higher education, while the Cape benefits from the training services of Cape Cod Community College and the specialized programs at the Massachusetts Maritime Academy and Woods Hole Oceanographic Institution, it lacks a traditional four-year college. The Islands have no higher education services at all. The region would benefit from expanded college extension services made possible through new telecommunications technology.

The region can capitalize on its educated workforce, environmental challenges and resources in marine research to develop its emerging industries of software development, environmental science and marine science.

Workforce Skills and Availability

Though the Cape and Islands Region has a highly educated workforce, a skills mismatch exists between workers involved in seasonal employment and the needs of emerging industries such as marine science and software design. As can be seen in Figure 15E, the region's percentage of management, professional and technical labor falls below statewide averages. The region's tourism industry requires workers familiar with foreign languages to accommodate the increasing number of foreign tourists. Additional workers skilled in health care will be needed to meet the demands of a growing retiree population. As remote areas with a very small workforce, the Islands suffer from a lack of labor availability for medium- sized or large firms.

Business Costs

Martha's Vineyard and Nantucket have inherently high business costs due to their remote location. According to the Department of Energy Resources, the Cape and Islands have traditionally had the highest average heating oil and gasoline prices in the nation. Nantucket has extremely high electric rates and the rates in the rest of the region are much higher than the statewide average. Both islands have very high housing costs, making it difficult for employees to find affordable year-round rentals or homes for purchase. While location offers the Islands a comparative advantage in the tourism industry, it serves as a disadvantage to the formation of other base industries, which would face higher costs in the form of supplies, time, and transportation.

Lack of Industry Diversification

The region's reliance on the tourism industry exposes it to considerable unemployment risk during downturns in the state and national economies. Reliance on tourism also exposes it to wide seasonal fluctuations in employment and economic activity. It needs to diversify into a wider range of year-round industries if it is to reduce these problems. The region can capitalize on its educated workforce, environmental challenges and resources in marine research to develop its emerging industries of software development, environmental science, and marine science.

Cape & Islands Regional Profile

Quality of Life

The entire economy of the Cape and Islands Region is in danger of being undermined by the deterioration of the environment and high quality of life that attract residents and visitors. In a 1991 Cape Cod Residents Survey, respondents ranked groundwater pollution, population growth, traffic congestion, pollution of coastal waters, and loss of open space as the most serious problems facing the Cape in the next five years.

A key issue on both the Cape and Islands is maintenance of the integrity of the local water supply. The concern for water quality is especially great in the region due to its complete dependence on local water sources. The region's sandy permeable soil and the shallow depth of the water table make its aquifers particularly vulnerable to contamination. Contamination by saltwater can occur when excessive withdrawals are made from supply wells located near saltwater ponds or tidewater areas. In addition, increased development has brought about increased risk of water contamination by cesspool and septic tank overflow.

Demand for coastal property has led to overdevelopment and erosion of coastal land and pollution of coastal waters. This affects both commercial and recreational uses of the region's waters. Excessive demand has also led to development of environmentally fragile areas such as eroding coastal banks, and property adjacent to wetlands and within the floodplain.

REGIONAL POLICY PRIORITIES

Investment

The region is very dependent on small businesses and the self-employed; entities which have inherent difficulties in obtaining bank and venture financing. Several of the programs described in this *Strategy* address these issues:

- By sharing risk with private lenders who choose to participate, the Small Business Capital Access Program can increase access to bank financing for Cape and Islands small businesses of all kinds, including retail stores, restaurants, and lodging.
- A new venture fund involving the Commonwealth's pension system, and phased reduction in the capital gains tax tied to the length of holding, would especially help start-up technology firms which need "patient capital" to see them through research and development stages.

Infrastructure

The Cape and Islands Region has benefitted in recent years from the major state highway projects that have dramatically improved road access; most recently with completion of Route 495 to the Cape Cod Canal. The Commonwealth will continue to address the region's infrastructure needs, particularly regarding the need for improved public transportation within the region:

- An intermodal transportation center in Hyannis is currently in the planning stage. The center will act as a central link between private and Cape Cod Regional Transit Authority bus, cab, ferry and air transportation that currently does not exist in the region. The proposed site is located one-quarter mile from the ferry landing, and within one-half mile from the Hyannis Airport.
- The Economic Development Capital Program can be used to finance major state capital projects which will create or improve upon the Cape and Islands' competitive advantages. A possible example might be tourist information centers and rest areas on the main routes leading to the region.
- The Economic Development Grant Program can provide funding for smaller projects which have a positive impact on private economic development. A possible use for these funds in the region might be the creation of access to the Barnstable Industrial Park from Route 6.

Regulatory Environment

The fragile ecology of the Cape and Islands demands that environmental protection efforts not be compromised. However, environmental protection is a complex process which can hinder development and raise the costs of doing business. Reforms to the permitting process and the encouragement of new methods of environmental treatment can allow economic growth and environmental protection to coexist. Several of the programs described in this *Strategy* address these issues:

- The Cape Cod Commission is moving in the direction of establishing a comprehensive permitting process which would coordinate local, regional, and state permit requirements. The Commission has worked jointly with the Massachusetts Environmental Policy Act Office (MEPA) to administer local and state permitting on specific projects, the result of which has been the reduction of the permitting process to one third its original time. This coordination could serve as an example for other potential alliances joining state, regional and local permitting authorities across Massachusetts.
- The Massachusetts Department of Environmental Protection (DEP) is moving towards greater flexibility in the permitting process. An example of this is Solar Aquatics of Harwich, which was involved in an experimental, not-yet approved, non-chemical treatment process. After lengthy review, DEP granted the firm an extension to its groundwater discharge permit for its wastewater treatment facility. While DEP's approval of Solar Aquatics' discharge permit can be seen as a reflection of the Commonwealth's commitment to the promotion of innovative technologies, in the future such approvals should become both faster and easier.

Education

Towns that have experienced rapid population growth must find ways to accommodate overflow demands on their public school systems. The region as a whole must work to

create innovative solutions to the lack of a traditional four year college and the special services it can provide. Cape Cod Community College is exploring the possibility of becoming a four-year school. Several of the programs described in this *Strategy* address these issues:

- Reform of primary and secondary education would be linked to increased state funding that should help towns struggling with increased student populations.
- The region would benefit from expanded college extension services through the state college and university system. The University of Massachusetts at Dartmouth and Bridgewater State College, in particular, should aggressively develop extension classes and curricula to serve the Cape and Islands through the use of telecommunications links and interactive computer programs. In the autumn of 1993, The University of Massachusetts at Boston will begin offering extension classes in their MBA program at Cape Cod Community College.

Training

The region's training programs have to address the needs of both workers involved in seasonal employment and the needs of emerging industries such as marine science and computer software. Training also is needed to upgrade services provided by the region's tourism industry, particularly language training to accommodate foreign tourists. Additional health care training is necessary to meet the demands of a growing retiree population. Several of the programs described in this *Strategy* address these issues:

- The Commonwealth is moving toward the creation of a worker training system which is driven by the needs of the region's industries, including those mentioned above. In conjunction with the MassJobs Council, the Cape and Islands Regional Employment Board has identified key industry clusters that are anticipated to grow and is working to define specific skills needed by those industries.

The marine science and technology industry constitutes a growing part of the Cape and Islands Region's economic base. It is fueled by world-famous research centers such as the Woods Hole Oceanographic Institution and Marine Biological Laboratory.

Photo courtesy of the Woods Hole Oceanographic Institution.

- The Commonwealth can support industry-specific brokers to act as liaisons between the region's key industries and training providers developing specialized curricula to meet labor needs.

Technology Transfer

The Woods Hole Oceanographic Institution and the Marine Biological Laboratory act as a driving force in the development of the marine science industry in the region. There are currently over 20 marine science firms in the Woods Hole area. The Institution and the Laboratory are also applying their research to the medical fields of neurology and biotechnology, presenting other opportunities for spin-off companies. Discussions are occuring about the possibility of an incubator program and facility for such firms on the Cape. This *Strategy* has also defined a positive role for the Commonwealth in encouraging technology transfer in the region:

- The Commonwealth's nearby public institutions, the University of Massachusetts at Dartmouth and the Massachusetts Maritime Academy, can act more aggressively to transfer technology from research labs to companies in the Cape and Islands Region. The University of Massachusetts at Boston, with its marine programs, is also an important resource for the region.
- The state can help foster technology partnerships between small companies in the Cape and Islands Region and other Massachusetts firms, universities, and private research laboratories such as Woods Hole that are doing research in similar fields. Partnerships could publicize technology breakthroughs and the availability of financial assistance, and create collaborations between companies that might not occur otherwise for the relatively small firms in this region.

Export Promotion

The Cape and Islands Region has been attracting an increasing number of visitors from Canada and overseas in recent years. The Region must increase its efforts to welcome foreign visitors through provision of currency exchange at local banks, creation of international signage, and better foreign language education for residents. The Cape's growing marine sciences and environmental consulting industries also hold great export potential. The Commonwealth also has an important role to play:

- In cooperation with private and public sector partners, the Massachusetts Office of Travel and Tourism (MOTT) markets Massachusetts and the Cape and Islands Region in the United Kingdom, Japan, France, Germany, Italy, Belgium, Spain, and the Netherlands.
- MOTT hopes to expand international tourism to the Cape and Islands through development of multi-language consumer

literature, establishment of strong international airline relationships and joint marketing ventures and the development of a multi-language Massachusetts marketing video.

- The Commonwealth's higher education institutions, particularly Cape Cod Community College and the University of Massachusetts through extension programs, can increase efforts to provide foreign language and cultural training for the region's residents.
- Efforts to expand exports of marine technology, environmental services and other products of the region can be assisted by the Commonwealth's trade missions and export promotion services provided by the Massachusetts Office of International Trade and Investment.

Quality of Life

Growth in population, housing development and local service industries has led to increased demands upon the Cape and Islands Region's limited resources. Along with this growth are increased concerns over the deterioration of the region's environmental quality including groundwater pollution, population growth, traffic congestion, pollution of coastal waters and loss of open space. The Commonwealth's economic development efforts will be sensitive to the fragility of the region.

- The Commonwealth recognizes that the development of new businesses in this region must not endanger the fragile environment upon which all residents and businesses depend. It will work to encourage businesses that are appropriate to the region's unique environment, and to provide and encourage the infrastructure and pollution control technologies that can mitigate the impacts of growth.

Acknowledgments

Choosing to Compete: A Statewide Strategy for Job Creation and Economic Growth was prepared at the request and direction of Governor William F. Weld and Lt. Governor A. Paul Cellucci. The *Strategy* is the product of a collaboration between the Executive Office of Economic Affairs, Stephen P. Tocco, Secretary, and the University of Massachusetts, Dr. Michael K. Hooker, President.

Funding for this project was provided in part by the Economic Development Administration of the United States Department of Commerce, whose support is gratefully acknowledged.

The project director was David B. Keto, Deputy Secretary for Policy, Executive Office of Economic Affairs. The project team at the Executive Office of Economic Affairs was led by Richard Henderson, Director of Economic Policy Research. The team consisted of Kelley Coleman, Manuel Garcia-Diaz, Ellen Gorowitz, Andreas Hildebrand, Barbara Kessner, Brenda Miller, Gail Mills, and Donald Milligan. Stephen Kostka, Kevin Kutz, Karen Nober, Camille Passatempo, Robin Pezzone, Susan Saia, and Diana Salemy provided additional assistance for the project.

The Maurice A. Donahue Institute for Governmental Services, Dr. J. Lynn Griesemer, Deputy Director, coordinated the participation of the University of Massachusetts in the project. The team consisted of David Bartley, Jr., Janice Raftery, Robert Silberzweig, and David Trumbull. The contributions of Thomas Chmura, University of Massachusetts Vice President of Economic Development, Dr. Arthur W. Eve, Executive Director, Donahue Institute, and William Ennen, Donahue Institute, are deeply appreciated.

The ongoing advice and assistance of Professor Michael Porter and Rebecca Wayland of the Harvard Business School and of Jeffrey Grogan of the Monitor Company is gratefully acknowledged. In particular, their permission to borrow findings, data, and recommendations from two studies of the Massachusetts economy, *The Competitive Advantage of Massachusetts* and *Towards a Shared Economic Vision for Massachusetts,* is deeply appreciated and the debt of this *Strategy* to those studies will be apparent to any reader of all three.

Maps for this volume were produced by the MAssets unit of the Division of Capital Planning and Operations. Raghda Jaber was the Project Manager, assisted by Laurence Liberge, Linda Alexander, Thomas Kinney, and Christopher McQuaid.

Census data and assistance in developing performance measures were provided by the Massachusetts Institute for Social and Economic Research, Dr. Stephen Coelen, Director, and Roy Williams.

Data and analysis for both the conferences and the *Strategy* were provided by the Department of Employment and Training, Nils Nordberg, Commissioner. The Field Research Unit provided much data and support and consists of Marilyn Boyle, Bernard Burns, Sally Currier, Frank Cahill, Gerald Fahey, Edward Kaznocha, Mary Richer, Paul Simpson, Jack Sprince, Dorothy Sullivan, and Robert Vinson. Rena Kottcamp, Martha Dailey, and Elliot Winer of the DET Economic Research and Analysis Unit also contributed greatly to this *Strategy.*

Proceedings for the topical and issues conferences were written by Stephen Andrade, Southeastern Massachusetts Partnership; David Bartley, Jr., Donahue Institute, University of Massachusetts; Nancy Goff, University of Massachusetts at Amherst; Dr. John Mullin, University of Massachusetts at Amherst; James O'Connell, Cape Cod Commission; Anne Rylestone, University of Massachusetts at Amherst; Dr. Paul Shuldiner, University of Massachusetts at Amherst; Dr. Joan Stoia, University of Massachusetts at Amherst; Dr. Chris Tilly, University of Massachusetts at Lowell; Dr. Richard J. Ward, University of Massachusetts at Dartmouth; and Dr. Bette Woody, University of Massachusetts at Boston.

The issues focus sessions and regional conferences that provided valuable public input to the *Strategy* were graciously hosted by the following: Dr. Cathryn L. Addy, President, Berkshire Community College; Dr. Daniel M. Asquino, President, Mt. Wachusett Community College; Dr. Joseph C. Deck, Interim Chancellor, University of Massachusetts at Dartmouth; Dr. William Hogan, Chancellor, University of Massachusetts at Lowell; Dr. Richard Kraus, President, Cape Cod Community College; Dr. Aaron Lazare, Chancellor, University of Massachusetts at Worcester; Dr. Richard D. O'Brien, Interim Chancellor, University of Massachusetts at Amherst; and Dr. Sherry Penney, Chancellor, University of Massachusetts at Boston.

The following persons from throughout the Commonwealth assisted the project by serving as panelists or moderators at the focus sessions and regional conferences or by providing their advice and assistance directly regarding regional issues and opportunities:

Berkshire Region: Dr. Thomas Aceto, North Adams State College; Mayor John Barrett, III, North Adams; Carl Bradford, Central Berkshire Chamber of Commerce; Charles Cook, Berkshire County Regional Planning Commission; Lew Cuyler, Berkshire Eagle; Sherwood Guernsey, II, Sherwood Guernsey Law Offices; Peter Hall, North Adams Community Development Corporation; Karl Heckler, Berkshire County Regional Planning Commission; Lorraine Heidemann, Berkshire Enterprises; Lois Houghton, First Agricultural Bank/Multibank West; Al Ingegni, III, Berkshire Regional Employment Board; Joan Melle, Berkshires Plastics Network; Mark Pasquini, Industrial Park and Development Corporation; Mayor Edward Reilly, Pittsfield; Al Robertson, Berkshire

Acknowledgments

Enterprises; Vicky Singer, Berkshire Enterprises; Stuart Sutherland, Northern Berkshire Chamber of Commerce; Robert Thompson, Berkshire Hand-Screened Wallpapers, Inc.; Henry Thornton, Southern Berkshire Investment Corporation; and Dennis Welcome, Central Berkshire Chamber of Commerce.

Pioneer Valley Region: Dr. David Bartley, Sr., Holyoke Community College; Allan Blair, Westover Metropolitan Development Corporation; Tim Brennen, Pioneer Valley Planning Commission; Elyse Cann, Machine Action Project; John Ciccarelli, Small Business Development Center; Russell Denver, Robinson, Donovan & Madden; Dianne Doherty, Small Business Development Center; John Doyle, O'Connell & Sons Building Contractors; Heriberto Flores, Brightwood Development Corporation; Michael Fritz, Franklin Hampshire Regional Employment Board; John Gallup, Springfield Chamber of Commerce; Ann Hamilton, Franklin County Chamber of Commerce; Marc Hanks, Economic Development Partners; Michael Kane, Mt. Auburn Associates; Francesca Maltese, Pioneer Valley Planning Commission; Paul McOwen, University of Massachusetts at Amherst; Mario Norbis, Tempro Corporation; Gordon Oakes, University of Massachusetts Board of Trustees; Art Schwenger, Franklin Hampshire Private Industry Council; Dr. Andrew Scibelli, Springfield Technical Community College; Dr. Katherine Sloan, Greenfield Community College; and Richard Stebbins, BayBank.

Central Region: Edwin Coughlin, Jr., Coughlin Electric Company; Robert Cox, Bowditch and Dewey; Robert Danielson, Mirick, O'Connell, DeMalle, and Lougee; Alex Drapos, Fletcher, Tilton, and Whipple, P.C.; David Forsberg, City of Worcester; William Gasko, Center for Technology Commercialization; Mark Goldstein, North Central Chamber of Commerce; Patricia L. Jones, Jones, Camp and Associates; Steve Jorjorian, Jr., Advanced Plating; Mohammed Khan, Montachusett Regional Planning Commission; Bruce Larsen, Worcester County Institution of Savings; Phyllis Lary, North Central Regional Employment Board; Richard McGrath, McGrath-Burnham Group; Brian Nickerson, Franklin Realty Advisors; and William Purcell, Worcester Area Chamber of Commerce.

Northeast Region: Scott Ackerly, Amesbury Chamber of Commerce; Robert Becker, Fleet Bank of Massachusetts; Joseph Bevilacqua, Greater Lawrence Chamber of Commerce; Gaylord Burke, Merrimack Valley Planning Commission; Peter Calkins, Dobroth & Fryer; Mark Chrisos, Raytheon; Pat Connolly, Connolly International Limited; Kevin Coughlin, Northern Middlesex Chamber of Commerce; Dr. Carole Cowan, Middlesex Community College; John Dimitry, Northern Essex Community College; Howard Feldstein, Lower Merrimack Valley Private Industry Council; Dr. Kenneth Geiser, Toxics Use Reduction Institute, University of Massachusetts at Lowell; Robert Hatem, Raytheon Co.; Virginia Keaten, Greater Lawrence Chamber of Commerce; Dr. Brad Knipes, University of Massachusetts at Lowell; Thomas Mendel, Malden Mills Industries, Inc.; Dr. Philip Moss, University of Massachusetts at Lowell; Robert Nieves, Greater Lawrence Chamber of Commerce; Donald Ruhl, Greater Haverhill Chamber of Commerce; Peter Vanier, Lower Merrimack Regional Employment Board.

Greater Boston Region: David Basile, Tucker Anthony; Dr. Barry Bluestone, University of Massachusetts at Boston; Robert Bradford, North Shore Chamber of Commerce; Deborah Canner, Genzyme Corporation; Christine Carberry, Biogen Corporation; Mary Carrigan, Groupe Bull; Dwight Conant, AAA; Arthur Faherty, AK Engineering; Gayle Friedland, Forest City Development; Brian Gilmore, Associated Industries of Massachusetts; Daniel S. Gregory, Governor's Council on Economic Growth and Technology; Richard Graham, Fallon, Hines, O'Connor; Philip Hart, Community Development Corporation of Boston; Richard Herring, Gloucester Co., Inc.; John Hodgman, Massachusetts Technology Development Corporation; Ronald Homer, Boston Bank of Commerce; Paul Johnson, MIT Enterprise Forum; Sara Johnson, Data Resources Inc.; Paul Kelley, Zero Stage Capital; Steve Landau, Metropolitan Area Planning Commission; Joan McCallion, Massachusetts Government Land Bank; James Miller, AB&W, Inc.; Katharine Preston, 1000 Friends of Massachusetts; Fred Ritzau, United Electric Controls Co.; Christopher Sands, Tucker Anthony; Karl Seidman, Massachusetts Government Land Bank; June Sekera, Industrial Services Program; David Soule, Metropolitan Area Planning Commission; Roger VanWinkle, Massachusetts Bay Community College; Michael Yunits, Yunits Engineering; and Sandy Zink, Industrial Services Program.

Southeast Region: Stephen Andrade, Southeastern Massachusetts Partnership; Mark Davis, Paramount Development Associates; Robert Karam, Karam Financial Group; John Michael, Mass Transfer Systems; Stephen Parr, Fall River Office of Economic Development; Marc Rousseau, City of New Bedford; Winthrop Sargeant, Standard Products; Richard Shafer, Taunton Industrial Development Commission; Kenneth Silva, Southeastern Massachusetts Partnership; Navjeet Singh, Southeastern Massachusetts Partnership; Stephen Smith, Southeastern Regional Planning and Economic Development District; Dr. Adrian Tinsley, Bridgewater State College; Stewart A. Washburn, Marketing Consultant; Stewart P. Washburn, Bristol Regional Employment Board; Paul Vigeant, Fall River Office of Economic Development; and Gus Yankopoulos, Wareham EDIC.

Cape and Islands Region: Doreen Bilezikian, Christmas Tree Shops; Kenneth Brock, Truro Planning Board; Stephen Bunnell,

Acknowledgments

MacDougall's Cape Cod Marine Services; Elliott Carr, Cape Cod Five; Angeljean Chiaramida, Martha's Vineyard Chamber of Commerce; Charles Clifford, Martha's Vineyard Commission; Joan Condit, Barnstable County Assembly of Delegates; Admiral Peter Cressy, Massachusetts Maritime Academy; Margo Fenn, Cape Cod Commission; William Fisher, Cape Cod Regional Technical High School; Michael Frucci, Cape Cod Chamber of Commerce; William Hinchey, Brewster Conservation Commission; Ben Jones, Barnstable Municipal Airport; Edward Lambert, Independence Park; Robert Mumford, Cape Cod Commission; James O'Connell, Cape Cod Commission; Robert O'Leary, Massachusetts Maritime Academy; Robert Paraday, Regional Transit Authority; Robert Randolph, Lower Cape Community Development Corporation; Charles Ritch, Bank of Boston; Alix Ritchie, Cape Cod Commission; and Howard Wheldon, Software 2000.

In addition, the following persons in state government assisted the project either by serving as a panelist or moderator at the focus sessions or regional conferences or by participating in the interagency document review working group:

Executive Office for Administration and Finance: Chris Alberti and Eric Kriss.

Division of Capital Planning and Operations: Commissioner Kevin Smith, Pamela Brown, Carol Gladstone, Gordon King, Laurie Louder, Christopher Pilkington, and Beth Rubenstein.

Executive Office of Communities and Development: Secretary Mary Padula, Carolyn Britt, Jeff King, Paul Regan, David Rodriguez-Pinzon and David Weiss.

Executive Office of Consumer Affairs: Secretary Gloria Larson, David Tibbetts and Stephen Wallace.

Division of Banks: Thomas Curry.

Division of Insurance: Walter Horn.

Department of Employment and Training: Commissioner Nils Nordberg, Donata Martin, Dr. K. Heinz Muehlmann, Louise Myers, Jack King, Richard Sullivan, and William Wiles.

MassJobs Council: Peter Koch, Steven Spinner and Stephen Hines.

Division of Energy Resources: Commissioner Stephen Remen, Rachel Shimshak and Francis Cummings.

Massachusetts Office of Business Development: Thomas Black, Nancy Jackson, and Bruce Stebbins.

Massachusetts Office of International Trade and Investment: Abbie Goodman and Elizabeth Lattimore.

Massachusetts Office of Travel and Tourism: Sarah Mann.

State Office of Minority and Women Business Assistance: Lynn Wachtel.

Executive Office of Education: Secretary Piedad Robertson, Peter Chisolm, Andy Gomez, and Winniphred Stone.

Higher Education Coordinating Council: Chancellor Paul Marks.

Executive Office of Environmental Affairs: Richard Armstrong, Andrew Brennan, Michael Freshour, Andrew Green, Thomas McShane, and Charles Steele.

Department of Environmental Protection: Commissioner Daniel Greenbaum, John Higgins, Edward Kunce, Jeffrey Lissack and Thomas Powers.

Department of Medical Security: Commissioner Jeffrey Ritter.

Executive Office of Labor: Secretary Christine Morris, Michael Wallace, and Eric Wetzel.

Department of Industrial Accidents: James Campbell and Thomas Griffin.

Executive Office of Transportation and Construction: Secretary Richard Taylor, Philip Puccia, Monica Staaf, and Sylvia Watts-McKinney.

Massachusetts Aeronautics Commission: Betty Desrosiers.

Massachusetts Highway Department: Laurinda Bedingfield, William Dalton, Ross Dindio, Peter Donahue, John Hoey, Brian McCourt, and Joseph Superneau.

Massachusetts Bay Transit Authority: Anthony Palmere and Steve Silveira.

Central Artery Project: Peter Shields.

Acknowledgments such as this are inevitably incomplete and represent only a fraction of all those who gave generously of their time and expertise. We regret any inadvertant omissions. We extend our sincere thanks to the more than twelve hundred participants in the forums and conferences whose comments, advice, and criticisms were essential to the formulation of the recommendations in this *Strategy*.

The graphic designer for this volume was Filosi Jones, Inc. The printers were Superlative Printing, Inc. of Canton, and InterCity Press of Rockland.

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Prepared by Dr. Joan Stoia, University of Massachusetts at Amherst

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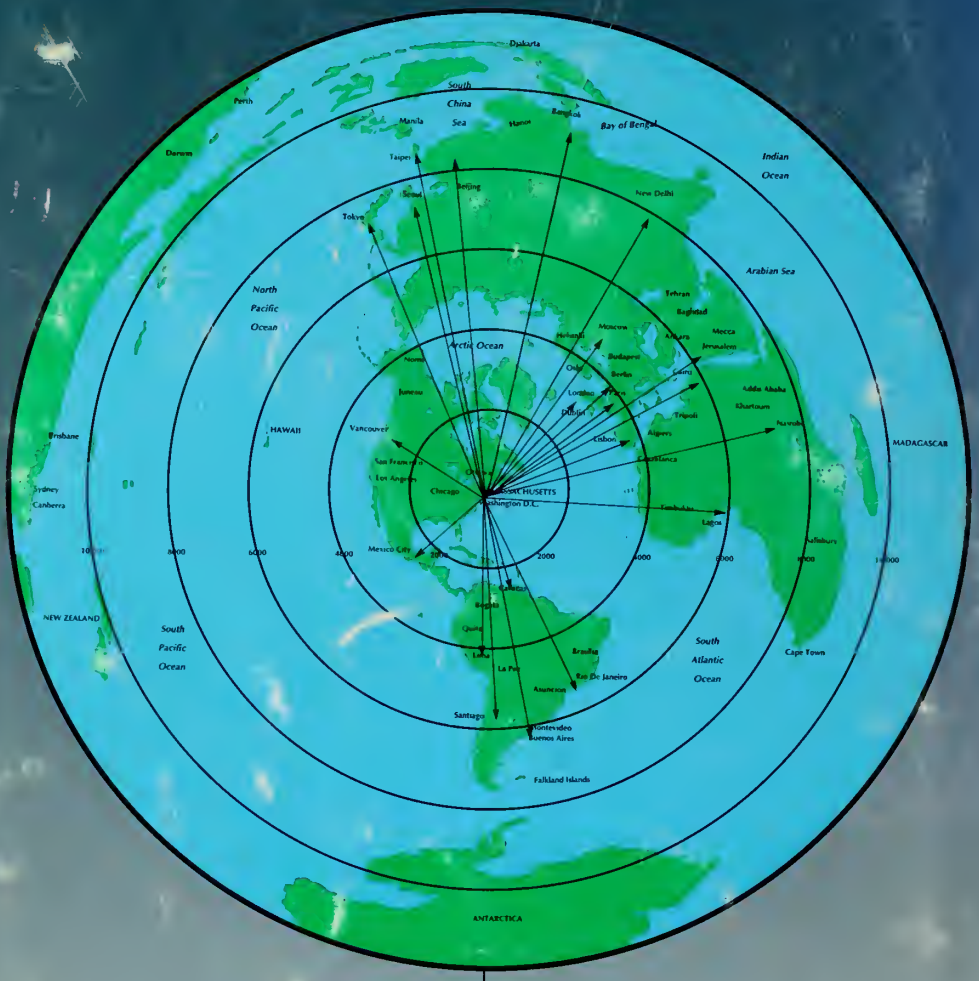

AZIMUTHAL EQUIDISTANT PROJECTION

Centered on Massachusetts.
Range rings are set at 2,000 statue-mile intervals from the center of the map.
Adapted from projection prepared by the Cartographic Laboratory, University of Massachusetts at Amherst, appearing in the *Historical Atlas of Massachusetts*, edited by Richard W. Wilkie and Jack Tager, by permission of the University of Massachusetts Press.

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